

# THE MARINE REVIEW

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## BUFFALO GRAIN TRADE.

Buffalo, Oct. 25.—This port is getting ready for the late fall grain business. Receipts of grain have been so far about 70,000,000 bu., considerably more than last season to date, and about on the average with the past six seasons. Elevator room does not increase here much now, though it ought to, and it would but for the complete control of the situation by the railroads. The demand for winter storage is now so much greater than it used to be, that the elevators ought to be able to make a fair living in spite of a possible grasping of all the summer handling by elevators controlled by the railroads.

It has always been against the Buffalo elevator owner proper that he was nothing but a warehouseman, not trying to control the grain-handling business till the grain was in sight and in former days paying no attention to the keeping of this route at its best so long as there was grain enough coming here to make a good profit. The enterprising way that one or two elevators, especially the Kellogg, has been handled for the past few years shows that it pays to be a little further in the grain trade than merely to stand and wait till it comes this way. Everybody might not be a great consumer of grain, but something in the line of shipper seems to be a great help to business in that line. The Kellogg has usually done about as it pleased, in spite of railroad opposition and is still doing a great amount of the handling here.

There is already a sign of elevator congestion here. It was reported last week that some of the railroad houses were full, all of course on account of the shortage of cars, for shippers do not care to hold their grain here yet. Canal rates have gone up twice lately, and if the barge canal was ready for use it would be doing a very large business now and the usual fall blockade would not need to appear in much force, if at all, for the plan of holding so much of the

last cargoes afloat here through the winter or a great part of it has become very popular with all branches of the trade. The elevators do not exactly relish the cutting of their winter rates in two, but so long as they can also get all the grain they want as a rule they have no real grievance, especially as they are thus not so badly pressed late in the season for room that they have not and they get so much more transfer business to do at their leisure after the close of the season.

For the past few seasons there have been so many late cargoes, ore as well as grain, coming here to lay up, that the task of finding room for the fleet has been a very great one. It appears that the local agents of the vessels have now given up trying to perform the hopeless task of laying up two vessels where there is room for only one, and will put the overflow into the outer harbor. There has always been good water and good shelter there from the time the long breakwater was any length, but now, with the four miles of it so well enclosed from all storm, there ought to be no possible objection beyond the difficulty there is in going to and from a vessel laid up in the open.

With the coming of the great carriers it is found that the inner harbor is not always the ideal wintering place it used to be for the smaller boats. Take a vessel 500 ft. long and it is a task to find a place that is all deep enough to float her well. There will be here and there a place that is not much deeper than she is, which is much worse than if the bottom were to correspond with the run of her bottom, especially, as often happens, when there is a ridge or sharp point here and there, for when there comes a time of low water the vessel settles down on this uneven spot and is injured.

There will be nothing of the sort in the outer harbor, and if the shipkeeper or captain does not like to depend on a

skiff when there is no ice and a tug when there is ice, to go to and fro it is not a very large matter. The fleet can come down on the harbor as mightily as it pleases, for the outer harbor would hold all the grain carriers on the lakes if there was need. If this plan is carried out there will be very little of the lying awake of nights on the part of vessel agents and owners and the bad days of the harbor master. Besides a single channel through the ice would open up to any that might be wanted to unload in mid-winter.

This port began last winter with about 8,000,000 bushels of grain and flaxseed afloat on winter storage, to say nothing of some millions that were to be unloaded as soon as possible. It was found that about the limit of room had been reached, so it may be of value to all concerned as well as a great relief to many to know that the larger space is to be used now.

JOHN W. CHAMBERLIN.

## ICE CRUSHER LADY GREY.

The steamship Lady Grey, launched at the yard of Vickers, Sons & Maxim, Barrow-in-Furness, Eng., Aug. 21, for the Dominion government, will be utilized for ice breaking on the St. Lawrence during the winter, and for survey and towage work during the open season of navigation. The principal dimensions and particulars are: Length between perpendiculars, 172 ft.; breadth molded, 32 ft.; depth molded, 18 ft.; draught normal, 12 ft.; draught mean when breaking ice, 13 ft.; displacement, 1,055 tons; speed, 14 knots. The hull is built of great strength to withstand the shocks due to impact against ice floes and to pounding of ice, and in view of surveying and other work the fittings and equipment conform in all respects to the requirements of the Board of Trade and the Canadian Steamboat Inspection Act. The bow is of the

Canadian type, formed for mounting and breaking through green ice and for going through pack ice. To counteract pressure a broad belt of heavy plating is fitted right fore and aft, extending in depth considerably above and below the water line, and the gross sectional form of the boat is such as to resist the lateral pressure of the ice, which might otherwise close in and nip the hull. To further counteract athwart ship pressure double framing has been fitted by the introduction of intermediate channels. Forward where the vessel first strikes the ice, these additional members extend from the keel to the main deck, while aft they are introduced between the bilge and the main deck. The side plating is also increased in thickness from the stem to a point well aft of midships. The hull is divided into six water-tight compartments, and a double bottom extends from the forward to the after peak bulkhead. The compartments forward and aft of these bulkheads are arranged as deep ballast tanks, into or from which water can be pumped to quickly alter the trim to assist the vessel in riding over the ice, where, by reason of the superimposed weight, the ice is broken. A large pipe connects these various tanks with the ballast pumps for quickly emptying one into another. In addition to the usual steam windlass and cargo winch, steam capstans have been fitted forward and aft for warping. The boat is fitted with large rudder and proportionately powerful hand and steam steering gear. The portion of the rudder head at and above water level is protected by a heavy casting, and the gear is made strong enough to withstand excessive pressure when working among ice. A large steel deck house is fitted on the main deck, arranged for the ship's officers and engineers' cabins, with suitable mess room, galley and pantry. A spacious saloon is also provided in the deck house for officials. A smaller private saloon, with a suite of cabins, is also provided in a teak deck house on the hurricane deck. Cabins are also provided on the lower deck aft. The crew are housed in the forecabin and on the lower deck forward. The ship has an electric lighting installation, and there is a 16,000 candle-power searchlight. The current is supplied by duplicate sets of engines and dynamos. The propelling machinery consists of two sets of inverted, vertical, direct-acting, triple expansion, surface condensing engines, having three cylinders working on cranks

placed at angles of  $120^\circ$  with each other, the sequence being high, low, and intermediate; when running at 130 revolutions a minute are capable of developing collectively 2,300 indicated h. p. The diameter of the h. p. cylinders is 19 in., of the intermediate cylinders 30 in. diameter, and of the low pressure cylinders 49 in. diameter, with a stroke of 27 in. Cast-iron liners are fitted in the h. p. cylinders only. The steam distribution valves are of the piston type for the h. p. cylinders, of the trick type for the i. p. cylinders, and of the double ported flat form for the l. p. cylinders, and each is actuated by valve gear of the double eccentric link motion, with reversing gear of the direct-acting steam and hydraulic description. The columns are iron castings of box section. The condensers, the back column, centrifugal pumping engines for supplying the circulating water, are fitted for each condenser, but there is a cross connection so that either pump can circulate through any or both condensers. Two sets of propellers are being supplied, a light set for ordinary summer use; the other set is specially designed for ice work. In each case the propellers are of the built-up type, with three blades. Steam is supplied at a working pressure of 180 lbs. per square inch by four single-ended cylindrical boilers, 12 ft. 9 in. in diameter and 10 ft. 6 in. long. A mechanical stoker system, with fan for air supply, will be fitted in Canada. In the stoke-hold there is an ash ejector fitted for discharging ashes overboard, in addition to two hand ash hoists. The naming ceremony was performed by Mrs. O'Grady Haly, wife of a former major-general commanding the Canadian militia.—*Railway and Shipping World*.

#### OUR MERCHANT MARINE.

At the recent meeting of the Pennsylvania Bankers' Association, at Philadelphia, Congressman John Dalzell spoke upon the subject of "Our Merchant Marine." He began by showing the vast sums expended in subsidies by Great Britain and other nations as contrasted with our own lack of care for the merchant marine. He deplored the necessity for employing foreign-built and foreign-registered vessels to carry our enormous exports, in view of the adequacy of our ship yards, materials and skill.

Tracing American ship building from colonial days, he showed that the supremacy of the United States was maintained until the introduction of steam vessels, the adoption of sub-

sidy by England and the Civil War, citing the favoritism under which the Cunard line was established and is still fostered by its government, and showed how France, Germany and Japan were emulating this example.

He said. "Consider for a moment the export trades dimensions. According to Secretary Wilson, of the department of agriculture, during the last 16 years the domestic exports of foreign products have amounted in value to \$12,000,000,000, or \$1,000,000,000 more than enough to buy all the railroads of the country at their commercial valuation.

"Figures from the bureau of statistics show that our exports of manufactures, which were less than \$700,000,000 in value in 1870, have grown to about \$600,000,000 in value in 1905, and they are still growing. So much for our output.

"Last year there came into the ports of this country merchandise to the value of \$1,200,000,000. We are sending out of the country each year in the neighborhood of \$200,000,000 in freight charges that ought to be kept at home. That means so much gold taken from the channels of foreign trade. Its retention at home would mean that much of a contribution to the prosperity of our own people.

"What can we do then? We can do what every other nation desirous of sea power does. We can pay subsidies, and we can afford to pay subsidies.

"And why not? Oh, subsidies are unconstitutional. But they were not unconstitutional when by means of them we built our great transcontinental railways across the Rockies and saved the Pacific coast to the union of states. Let us not be deceived by names. I grant you that it is not a proper governmental function to extend aid or bounty to merchant private enterprises. I deprecate as strongly as any man can the extension of governmental jurisdiction to such. I do not believe that the government ought to engage in any business that can as well be conducted by individuals or corporations. I view with solicitude the socialistic tendency of the times, and would not add thereto by act or suggestion. But the navigation of a nation is more than a private business.

"The question of the rehabilitation of our merchant marine is, in my judgment, one of supreme importance as relating to our independence as a nation in time of peace and in time of war.

"It ought to be above and beyond

partisanship. And it is because I believe that nothing more is needed than a fair understanding of the situation on the part of our people in general to bring about their indorsement of the legislation now pending, that I have at this time asked your attention to the subject. If the people will only speak, legislators will be prompt to act.

"Hearken, then, to the conclusion of the whole matter: Without an efficient merchant marine we are without independence either in time of peace or in time of war."

### LAKE SHIP YARD METHODS OF STEEL SHIP CON- STRUCTION.

BY ROBERT CURR.

Fig. 78 shows the starboard stern plating and Fig. 79 molds for expanded plating.

Two plates are marked from molds

tained from the expanded mold for the shell D K, Fig. 79 and the stringer flange from the stringer mold, Fig. 66.

When the molds are applied to the stringer angle the buttock lines 2B, 4B, 6B, 8B, 10B, 12B and 14B must agree at the heel of the angle where the molds come together.

Fig. 81 shows the set line in true form and the lines dropped from the set line D F in sheer plan, Fig. 78, will show how same is obtained by following the buttock lines from the half breadth to the sheer plan, Figs. 76 and 81.

This set line is used for getting the fore and aft curve of the stern plating. The butts of plating are marked on this line, Fig. 81, and as this is the actual width of the plates, a set is made of iron to this line on the half breadth plan and on the set iron the buttock lines are copied, so that when the set iron is applied to the line D F the buttock lines on the set

a foot from the set line at the bottom of the plate and another twelve inches from the top butt.

Plate No. 1 when marked would show two set lines, buttock lines 2 and 4 on each side and center line all center punched in for further reference.

The set lines are used for applying the set iron obtained from D F2 on the half breadth plan, Fig. 81, and the buttock lines are used for the purpose of placing the plate in the bending rolls right. The plate is put in the rolls so that the buttock lines are parallel to the rolls.

By taking care to roll the plates to the buttock lines, or at right angles to the set line, there will be no fear of the work when completed being a misfit.

In Scotland the fairing up process of stern building is the same as practiced on the lakes. The method of doing this work on the lakes being copied from Scotland.

In Scotland the stern builder is of more consequence than on the lakes for molds are not supplied to him with holes drilled and an exact copy of the plate.

The molds supplied to the stern builder in Scotland consist of, 1st, the expanded cant frame and beam molds, Fig. 76; 2nd spar deck stringer skeleton mold, Fig. 66. Mold for set line D1 F2, Fig. 81, shell plating expansion mold, Fig. 82 and board with bevels for cant frames.

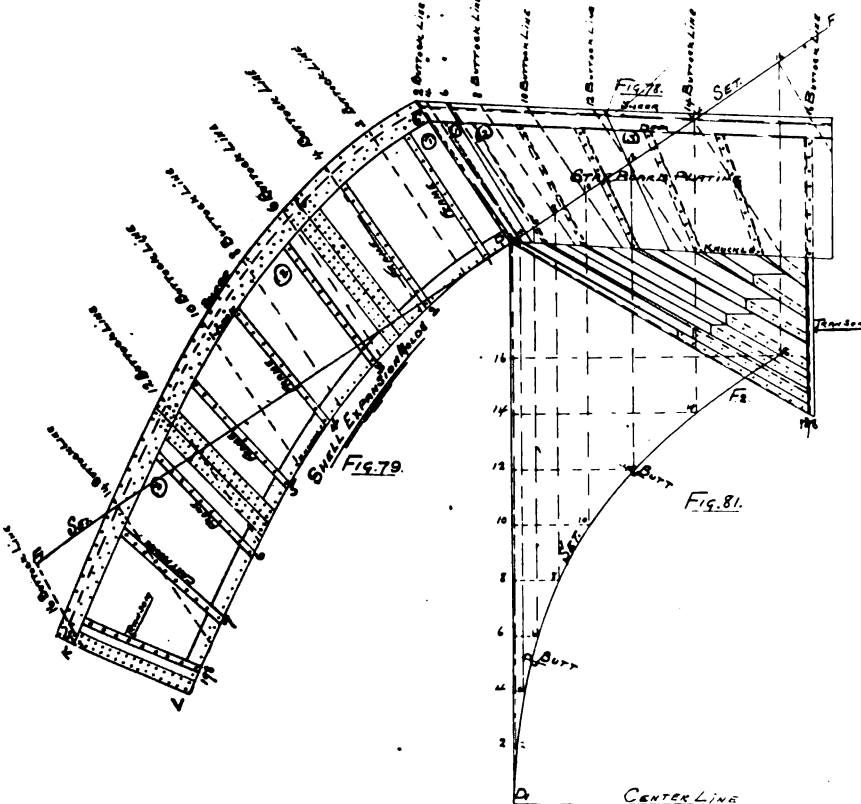
The work proceeds as follows in Scotland for stern building.

After the plater receives the molds and bevels, he bevels the frames and bends them to suit the knuckle, R, Fig. 76.

The expanded cant frame and beam mold as a rule are in one piece, as shown by Fig. 76, the line of the depth and width of beam brackets and height of floors being scratched in on the molds to represent them as shown on Fig. 76. The frame beam, beam bracket and floor plate after being punched are bolted together and fastened to the transom which is fastened to a post near the ground. The stringer plating is laid down on the ground and the shape marked upon it with the mold made for that purpose.

The beams are lined in on the plate and with template wood the holes are copied from the beams hung to the transom frame.

When the stringers are punched they are put on top of beams which fairs up the beams and brings the cant frames to their proper position.



2 and 3 and No. 1 mold being for one side the mold is turned over to complete the port side of the plate.

The cant frames 1, 2, 3 and 4 have the same number of holes to shell, so that eight cant frames can be marked alike on the plating. 5, 6 and 7 cant frames have the same number of holes so that for the cant frames to the shell two molds will suit the purpose of marking same for all the stern plating.

Fig. 80 shows the molds for the stringer angle, the shell flange is ob-

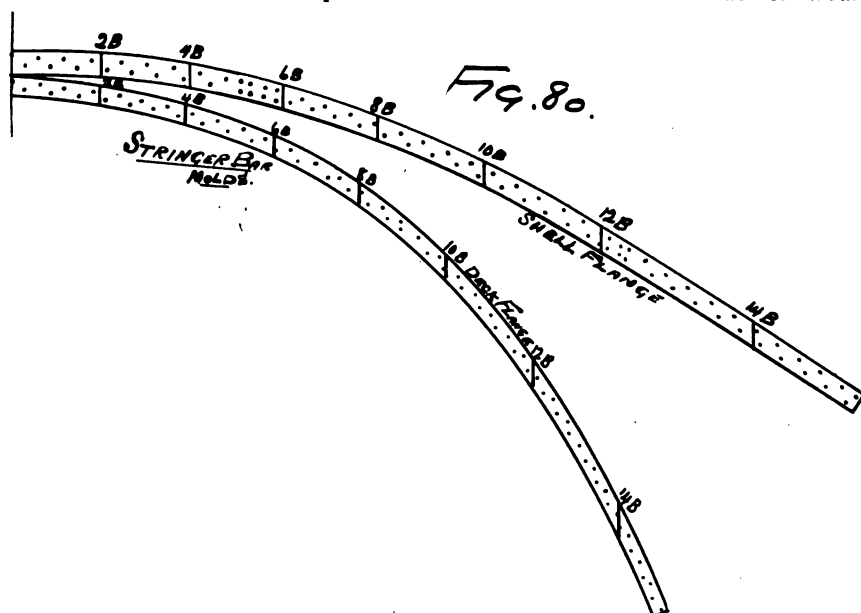
iron must agree with the buttock lines on the expanded plating.

For example, take plate No. 1, the mold would be applied to the plate, the holes as shown on mold all marked and the lines center, set and buttocks lined on, and when the mold is removed these lines are marked with a center punch so that the lines will not be rubbed out in handling before the plate gets to the rolls. The set line D F being near the knuckle line, two other lines would be put on the plate parallel to the set line, one

The stringer bar is bent to the mold and put up in place and marked, it is then taken down and punched

with the exception that the butt holes are punched.

The holes for the knuckles would

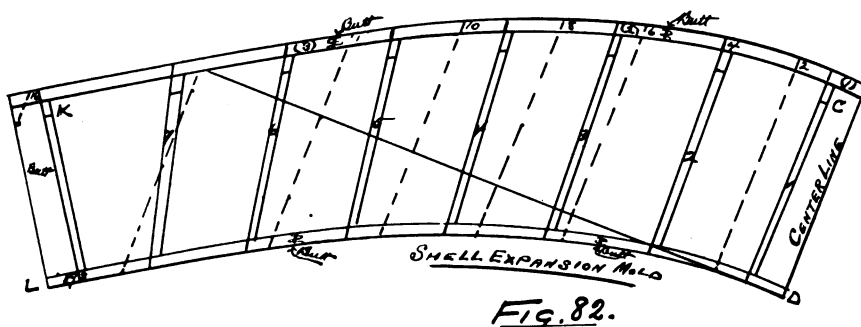


and put up in place and bolted down.

The shell plates 1, 2 and 3 are laid down on the ground and a mold for the expanded plating, Fig. 82, is laid upon them and all the lines copied on. The butt straps are punched and the rivet holes marked on the plating, this completes one side of the plating, the mold is then turned over and the other side of the stern plating marked.

The cant frame lines are all lined on the plates as shown by numbers 1, 2, 3, 4, 5, 6 and 7 and as the cant frames are all punched the holes are copied from same with template wood, the deck line C K, Fig. 82, being a guide for applying the template to when marking the plates, the under side of the stringer plate being the guide when copying the holes from the stern frames in place.

The buttocks and set lines are marked in with a center punch for fu-



ture reference as explained.

The frame and butt rivet holes are all that is punched at this stage. The plating is put in place after being rolled to shape and the balance of the holes marked. Fig. 78 is about what the stern would look like at this stage,

be laid out when hung up so that the punching would be done from the outside when the plates are taken down. The holes for the stringer angle would be marked from same, then the plating would be removed and completed at the punch machine, etc. All

the stern would be taken apart and carted to the after end of the vessel where it belongs unless the stern was built before the frames aft were up and faired, in that case the stern will be left hanging to the post until it could be put up in place.

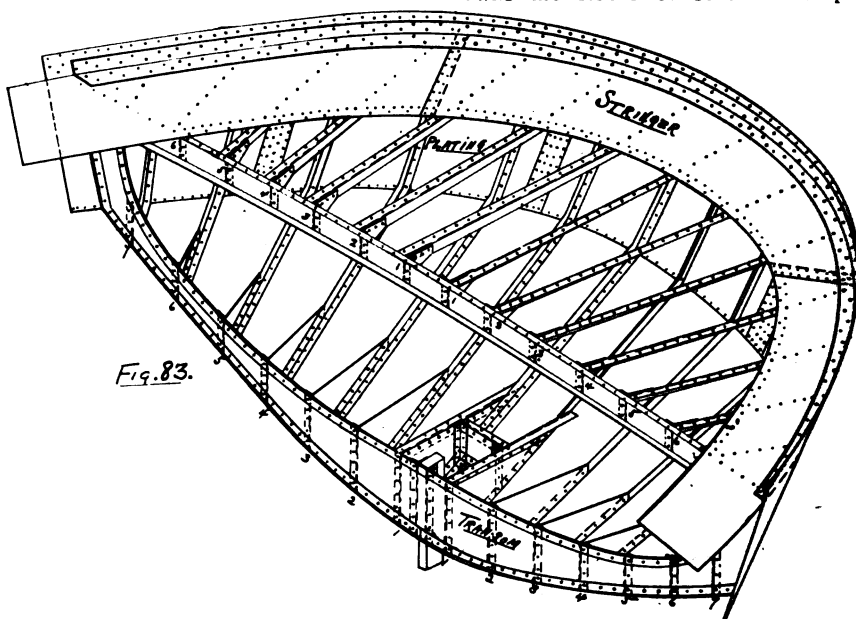
A harpin bar is usually fitted inside of the cant frames to fair up the cants in place on the ship. This bar is generally placed level in line with the knuckle.

Fig. 83 shows an isometric plan of the stern completed by either method.

In Scotland for marking, punching, setting and erecting the stern complete as shown would cost one hundred dollars (\$100.00) while on the lakes this would be completed for one quarter of that amount.

### LAKE SUPERIOR CORPORATION.

The Lake Superior Corporation, which owns the stocks of several companies



centering around Sault Ste. Marie, has issued its report for the year ended June 30 last. This shows that the surplus over charges increased more than \$500,000 last year, while the total income was nearly doubled. The income account compares as follows:

	1906.	1905.	Increase.
Int. on invest. sec.	\$1,102,044	\$543,455	\$558,589
Misc. net inc.	36,700	42,084	*5,384
<b>Total income</b>	<b>\$1,138,744</b>	<b>\$585,539</b>	<b>\$553,205</b>
Coups. from 1st mtg. bonds out	452,200	452,175	25
Int. accrd. 1st mtg. bonds	37,683		37,683
<b>Balance</b>	<b>\$648,861</b>	<b>\$133,364</b>	<b>\$515,497</b>
Gen. exp. tax, etc.	91,981	98,562	*6,581
<b>Surplus</b>	<b>\$556,880</b>	<b>\$34,802</b>	<b>\$522,078</b>

\*Decrease.

This company is the successor of the old Consolidated Lake Superior Co., and includes Bessemer steel works and rail



mill, blast furnaces, ore, nickel and copper mines and smelters, sawmills, wood pulp mills, electric street railways, and freight and passenger steamers. In his report, Charles D. Warren, president, says that all the important plants of the operating companies have been actively employed, and the hope is entertained that the current year will see all the plants busy. The general balance sheet of the company compares as follows:

Assets:		
Invest., loans and securities of subsidiary companies .....	1906.	1905.
Cash .....	\$51,184,072	\$51,201,928
Collateral securities ..	55,261	76,095
Treasury bonds .....	125,001	150,000
Furniture and fixtures ..	956,879	956,879
Due from subsidized companies (advances) ..	470	354
Accounts receivable ..	2,064,279	1,531,543
	9,293	
<b>Totals .....</b>	<b>\$54,395,262</b>	<b>\$53,916,799</b>
Liabilities:		
Capital stock .....	\$40,000,000	\$40,000,000
Bonds .....	13,000,000	13,000,000
Bills payable .....	688,235	800,000
Canadian Imprmt. Co. ....		4,677
Coupons unpaid .....	73,873	25,900
Due subsidiary companies ..	7,288	29,400
Suspense account .....	34,183	22,020
Profit and loss (surplus) ..	591,682	34,802
<b>Totals .....</b>	<b>\$54,395,262</b>	<b>\$53,916,799</b>

In his annual report, President Warren says that the blast furnaces and steel rail plant, which is the principal industry of the corporation, demands the largest share of attention, as it absorbs in its operation the greater proportion of the financial resources of the company, while its further needs are inadequately met.

He says this branch of the work shows great improvement and development, the estimated production of 150,000 tons of steel rails for the year having been exceeded by about 10,000 tons.

The record output of steel rails for a day, which was 1,004 tons, shows the possibility of the plant, the president says, and proves the advisability of a further capital expenditure on the steel work. Continuing, President Warren says:

"Your directors would like to provide at the earliest possible date for another blast furnace having a daily output of at least 400 tons. This would nearly double the present production of pig iron and thereby furnish material adequate for the most advantageous operation of the rail mill. The present blast furnaces operated during the past year have made 130,902 tons of pig iron, which is considered a very satisfactory showing.

The construction of two 30-ton open-hearth furnaces has been authorized and their completion is expected early in December, 1906. This extension will make way for the profitable use of a large amount of scrap, which has been accumulated, and furnish additional material needed in the operation of the rail mill. This new open-hearth plant has been planned with a view to extension.

Less ore has been taken out of the

Helen mines during the preceding year. Several causes have combined to produce this result, among which may be named labor troubles and a fire which destroyed the hoisting apparatus and machine shop, all of which have since been replaced. The development work continues. Considerable bodies of pyrites have been found for which a ready market is available at profitable figures.

The two railways and the fleet of steamers have been profitably operated. The two traction companies together have shown increased business and better results. An extension of the route on the American side is under consideration. It is believed that the usual history of street railways in cities—an increase of business from year to year—will be realized from these operations.

Propositions in regard to the nickel properties from outside parties have been considered, but as yet nothing has been presented which seems worthy of acceptance.

For the two years ended with June 30 last, \$527,883 was expended for betterments and extensions to property and plants.

### CONCRETE BREAKWATER AT HARBOR BEACH.

(From *Concrete*.)

One of the most notable examples of concrete construction now under way in the United States, both from its commercial importance and its size and strength, is the new concrete breakwater, or artificial harbor, begun in 1904 and now in course of construction at Harbor Beach, to replace the old timber structure. Situated as it is, 60 miles from Port Huron, and exposed naturally to the full force of Lake Huron gales, this artificial harbor is one of the most important and most extensively used of the storm refuges of the great lakes.

The importance of providing an adequate protection to shipping at this dangerous point led originally to the erection, at great expense, of the first breakwater, constructed of timber and cribs weighted with stone. The perishable nature of the timber structure above water has made the annual bill for repairs very heavy, and a few years ago, when the superiority and economy of concrete construction had been demonstrated beyond a doubt, the government decided to rebuild this work along modern lines and with modern material.

The harbor presents to the fury of Lake Huron a gently outcurving front of 8,975 ft. It is in three sections and is open at the shore at either end. The northerly section has a stretch of 1,500 ft., with an opening of 300 ft. for the entrance of vessels. The middle section

extends 4,675 ft. Then comes the southerly opening of 600 ft., and then the southerly section stretching 1,900 ft. The northerly and the southerly section are still of timber, the work of converting the structure into a concrete harbor having begun at the northerly end of the middle section. The work there in progress illustrates the method that will be followed, with perhaps slight modifications, until the whole enormous job is finished.

In this section, the old timber work has been removed to a depth of about 3½ ft. below the high-water stage. The foundation thus secured is leveled up and decked over with plank 6 inches thick and 12 ft. long. On this submerged foundation are laid the concrete footing blocks. These are 10 ft. long, 4½ ft. wide, 4 ft. thick and weigh about 12 tons each. They are molded on the northerly pier and transferred by float to the middle pier as required. When placed in position they are locked together with iron bonds set into them, thus giving a rigid foundation plain on which to rear the massive monoliths that are to resist the full force of the waves. On the upper face of the footing blocks also are depressions into which enters some of the concrete of the massive upper blocks, this penetrating portion of the greater blocks acting as an anchor or dowel.

On the foundation plane described, the mass of concrete or monolithic concrete work is going forward at the rate of one immense block each day. These are about 13 ft. high, 36 ft. wide and 25 ft. long.

These great monoliths weigh about 380 tons each and one can now be molded in from 6 to 8 hours, though at first 24 hours were required. The mass sets in about 6 hours and the form is usually left on for about 48 hours. The block is kept covered with burlap and is sprinkled with water for about 10 days. These great sections are, of course, molded in situ and are anchored to each other with railroad rails in 6-foot lengths, 3 bonds in the end of each block. The composition of the concrete work, both of footing blocks and superstructures, is one part of cement to three parts of sand and six parts of gravel. Eight of the footing blocks are made in a day. In the earlier stages of the work, crushed stone was used in the footing blocks, but now only gravel is being used throughout.

Work on the middle pier is divided into three sections. The first section has been completed, the second section will be completed in 1907, and congress has yet made no provision for the third section or the north or south piers. The present season and last year have been particularly favorable to the steady progress.

ecution of the work, and it has progressed very satisfactorily. The successful completion of the work will demonstrate in a most effective way the vastly superior value and greater economy of concrete construction, since the Harbor Beach breakwater is an entirely artificial structure built into Lake Huron from a wholly exposed shore, and is the only structure of this character on the great lakes. Other places of refuge from storms have been constructed with certain natural advantages as a basis on which to work. Besides its increased safety in its new form, the annual repair bill should be very low and the structure will be a permanent one. Its erection has provided a safe harbor for a large annual tonnage of shipping, since about a thousand craft take shelter here each year. These are of all sizes, from the lake pleasure yachts up to boats drawing many feet of water. There is a depth of 18 ft. of water in the northerly opening and 21 ft. at the southerly entrance to the harbor. As before stated the piers do not now reach to the shore, but the question of extending the north pier to the shore or leaving only a narrow opening there is being considered. This is because the strong current that now sets through the harbor results in silting up portions of it and necessitates dredging.

This work is being done by Hugo & Sims, of Duluth.

#### NEW CANADIAN STEAMER.

Messrs. Scott Ship Building & Engineering Co. of Greenock, Scotland, have built for Messrs. Donaldson Brothers, of Glasgow a fine new passenger and cargo steamer to cope with the immense emigration traffic now conducted by this firm. The ship, named the *Cassandra*, is a twin-screw vessel distinguished by a number of features of more or less novelty. These are concerned with accommodation, and with the facility for transforming passenger space into storage space for cargo, and for the carrying of cattle and vice versa. She is of the shelter-deck type, and of about 8,000 tons gross register, 450 ft. in length, 53 ft. in breadth, by 40 ft. depth to shelter deck. She has been built to the highest class at Lloyds, and conforms with all the requirements of the board of trade for emigrant-carrying steamers. No accommodation for first class passengers has been provided, but there is ample and high class accommodation on the shelter, bridge and boat decks for nearly 200 second class passengers. Such provision in every essential respect being equal to the provision in

this way made for first class passengers in many ocean-going steamers. Accommodation is also provided for about 1,000 third class passengers in thoroughly sub-divided rooms to hold two and four passengers, the berths being of the collapsible type, and easily removable when necessary. While the vessel is primarily intended for the conveyance of passengers, she is also equipped for the carrying of cargo and cattle. She is designed to carry on her assigned load draught 9,000 tons of deadweight cargo, and stowage space for this cargo is provided in five holds. She has also a double bottom throughout for the carrying of water ballast. The *Cassandra* is fitted with twin-screw triple-expansion engines, having cylinders 26 in., 42 in. and 70 in. diameter, with a piston stroke of 48 in. The shafting throughout is  $\frac{1}{2}$  in. in excess of the diameter required by Lloyds rules. The surface condensers are cylindrical with large cooling surface, built of steel plates and supported on wing columns. Two air pumps of the Edwards type are fitted, and the water is circulated by two separate centrifugal pumps, either being able to supply the two condensers. An auxiliary condenser is also provided for dealing with the exhaust steam from the winches and auxiliaries. Steam is supplied by two single and two double-ended boilers, all of them 15 ft. nine inches diameter, and 11 ft. six inches and 20 ft. long respectively. There are eighteen furnaces of Morrison's corrugated type, and balanced furnace doors are fitted to each. The trials which the ship underwent on Aug. 31 were exhaustive, and a mean speed of  $14\frac{3}{4}$  knots was attained with 5,500 I. H. P., the engines running at about 88 revolutions and with normal draught. The service speed will be about  $13\frac{3}{4}$  knots.

#### DREDGING FOR DETROIT TUNNEL.

Butler Bros. & Hoff, of New York, who are to build the Michigan Central railway tunnel under the Detroit river, have awarded the dredging contract to the Dunbar & Sullivan Dredging Co. of Buffalo. Work has been begun. The bottom of the trench will be 75 ft. below the surface of the river. It will be 48 ft. in width at the bottom and 100 ft. wide at the top. Contract for the steel tubing has been let to the Great Lakes Engineering Works. It will be practically one mile long and will keep the St. Clair plant of the company busy well into 1908.

#### MR. S. F. EDGE DESCRIBES THE IDEAL BOAT.

Mr. S. F. Edge, whose qualifications to write on the subject are known to everyone, says in a long letter that a special type of boat is necessary for the work of scouting for the navy, such as the *Yarrow Napier*, No. 1,176, (see *MARINE REVIEW*, Oct. 4, for photograph of this motor boat) recently acquired by the British, and which combines speed with sea-going qualities. On a trial run in a lumpy sea she ran from Poplar to Dover and back at an average speed of over 24 knots, the total length of the trip being 202 miles.

This boat, he adds, although the first and built as a demonstrating craft, has proved the possibilities of the use of internal combustion engines for naval work. Its length is 60 ft., and driven by motors developing 300 H. P., driving triple screws, it has obtained a speed when fully equipped for service of  $24\frac{1}{2}$  knots. A second class torpedo boat of the same dimensions driven by steam would have a speed of only 16 knots, which shows the tremendous advantage to be gained by the adoption of the internal combustion motors. A smaller crew is needed also for motor boats, thus lessening the risk of loss of life.

Their chief function would be to protect a harbor, the mouth of a river or an estuary, for which purpose they would appear to be the cheapest and best means of defense. Their shallow draught, about 3 ft., enables them to keep close in to the coast, and they would not be visible for any great distance, especially as there is no funnel and no smoke, which is the first thing to be seen in the case of a steamboat.

When it is considered that one destroyer of the river class costs about £80,000, which is equivalent in money value to twenty such little wasps, it can be easily realized that an attacking fleet would be in far greater danger if attacked by twenty such little vessels (each of which could carry one or two torpedoes).

Owing to its comparatively light weight (about 3 tons), such a boat could be transported by rail to any part of the kingdom, which would be a tremendous advantage in time of war. These craft would also, no doubt, form part of the equipment of the larger battleships, where they could be carried on the decks. Then, being ready to start at a moment's notice, they should prove very useful for patrol work, etc., and would doubtless render a good account of themselves in a general engagement.



On the score of reliability they should leave little to be desired, as, being fitted with three separate sets of machinery and three propellers, they would still be under control if either one or two of the sets were disabled or destroyed.

The reason that a much greater speed can be obtained with internal combustion engines than with steam is that the total weight of machinery per horsepower in the former case is very much less than in the latter, so that this enables one to either put in more power, or the same power for less weight and displacement. This principle can be applied to larger boats; but at the present time there are other considerations which prevent it from being utilized for driving, say, a destroyer, although we have it on the authority of Mr. Yarrow that it would be possible to drive a 220-ft. destroyer at 45 knots by the use of internal combustion motors. There is no doubt that the time will come when this will be done, and possibly the same principle applied even to battleships and cruisers.

#### AT HEAD OF THE LAKES.

Duluth, Oct. 23.—The week under review was one of large shipments in the ore trade, such substantial gains having been made that the Missabe road is confident that with no heavy storms interfering to tie up the boats, the Duluth docks will ship 11,000,000 tons of ore. The other docks at Two Harbors and Superior also increased their shipments over last year, though not in such a marked degree. The figures for the week are as follows: Two Harbors, 247,166 tons; Duluth, 420,288 tons, and Superior, 193,330 tons, a total movement for the seven days from Oct. 14 to 21 of 860,784 tons. In the same week last year the tonnage moved was Two Harbors, 219,788 tons; Duluth, 256,435 tons, and Superior, 163,128 tons, a total of 639,351, showing the splendid gain of 221,433 tons. As will be noted, the docks at Duluth alone were responsible for 166,417 tons of this increase. The total for the season up to this time from these three ports is 21,371,207 tons, about 500,000 tons less than the total shipment last year from the Mesabi and Vermillion and 2,710,936 tons more than last year up to this time. Of the season's total the Missabe docks have contributed so far 9,331,519 tons.

The grain trade has developed no unusual features during the past week, the shipments falling off somewhat. The market rate to Buffalo remains at 3 cents. The steamer James Laughlin is due to arrive the middle of this week

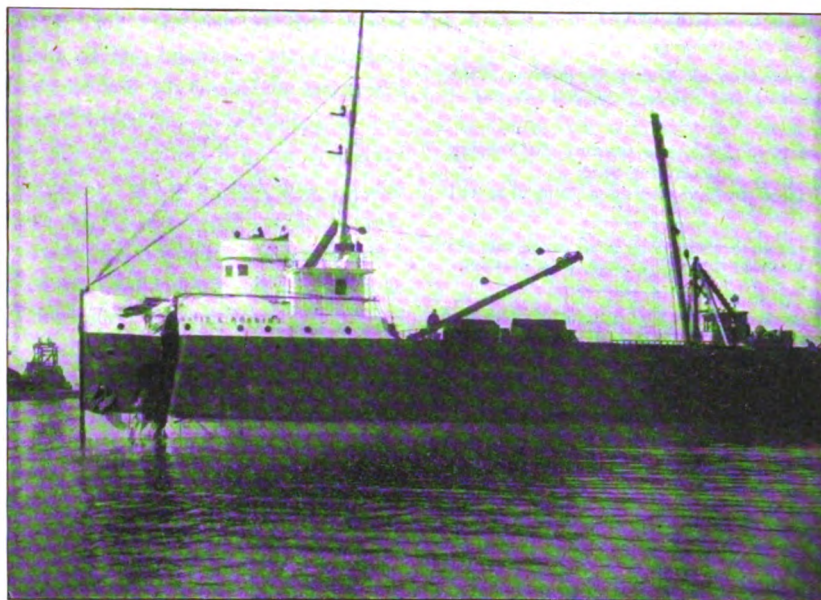
to load flax, and it is expected that new records will be made both as to size of cargo and dispatch in loading. She will load at the Great Northern elevators, where preparations are being made to get the grain in shape for quick work. The receipts and shipments for the past week as compared with the preceding seven days are given as follows:

	Receipts.		Shipments.	
	Oct. 14.	Oct. 21.	Oct. 14.	Oct. 21.
Wheat	2,234,354	2,101,841	2,012,205	1,717,613
Corn	4,169	4,897	.....	.....
Oats	284,378	282,060	291,692	163,166
Barley	430,194	539,455	222,637	298,807
Rye	41,564	32,975	15,545	68,232
Flaxseed	927,651	1,295,197	734,977	636,233

The noticeable differences are in the increase of flax receipts, which have been coming in in larger quantities for several weeks past, and probably have not

and the Sinaloa was just entering through the bridge. Signals were exchanged, but neither boat stopping and the already close quarters being the more limited by boats at the adjoining coal docks, the collision was impossible to avoid. The Sinaloa was damaged to the extent of about \$800, but the port bow of the Robbins was stove in from below the waterline to the deck rail. During the week the bow has been lightered and the damaged plates removed. The new plates will be put in place during the coming week, and ten days should find the Robbins ready to sail. She had suffered, it is estimated, \$12,000 damages.

At the Superior ship yards the work



STEAMER FRANCIS L. ROBBINS AFTER COLLISION.

reached the high-water mark yet. The wheat shipments show a falling off of approximately 300,000 bushels.

This morning, Oct. 23, as the whale-back barge No. 134 was being towed up the harbor, the tugs dragged her across the bow of the Kensington. The anchor of the Kensington stove a hole about four feet in diameter in the side of the barge about amidships and between the bottom and middle fender strake so that the barge, though light, had to be listed to port to prevent the ingress of water. The anchor of the Kensington was carried away by the barge and protuded from the hole in a perfectly natural manner. The barge was towed up alongside the dock of the Superior Ship Building Co., where it will be repaired.

The Francis L. Robbins, which was in collision with the Sinaloa just inside of the Interstate bridge a week ago, has been lying at the entrance to Howard's Pocket since that time. The Robbins was coming down from the dock loaded

on the new Hawgood boat is well on toward half done, as the launching will occur early in the spring. The framing with the exception of the stern post and stem is in place, as are also all of the arch beams except four. The engine room bulkhead is up and most of the side plating amidships is in place. Within ten days work will be started on the 600-foot boat to be built for next year.

When the Atlantic transport liner Minneapolis arrived recently she had aboard a new coaling machine known as the MacKnow-Cameron coal-loading machine, constructed by the Thames Iron Works, of London, for trial by the United States navy. It is asserted that by use of the machine ships can be loaded at sea at a distance of 350 ft. from the collier. The apparatus is to be tried on the collier Abaranda. The coal is shipped in bags over an iron cable and is shot on board through a chute 60 ft. long.





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### PERSISTENT MISREPRE- SENTATION.

There are important newspapers in the United States, today, still printing the misleading and untruthful statement that if our tariff on imports were reduced, and American ship builders relieved from the grip of the steel trust, ships could be built in this country as cheaply as anywhere. These newspapers do not know, or, if they do know, then they are purposely misleading, that for fifteen years all materials imported for the purpose of building, repairing, or fitting out a ship in this country for the foreign trade are admitted free of duty; that our ship builders are entirely free to buy in the cheapest markets in the world, and to bring in their purchases duty free, if building for the foreign trade.

Other newspapers are still advocat-  
ing "free ships," which means the free

American registration of foreign-built vessels owned by Americans, although the owners of such vessels informed the Merchant Marine Commission two years ago that, even if permitted, they would not register their foreign ships as American; that they were able to make more money with them under foreign flags, with foreign officers and men, than they could under the American flag. As a result, no one in congress is advocating "free ships." Nevertheless, some of these newspapers would have us believe that free ships would be a remedy. Not only would it be necessary for us to buy our ships abroad, but it would also be necessary for us to allow aliens to command, officer and man them, and to amend the law which fixes the victualing scale on board American vessels to make it conform to the poorer quality and less quantity required by other nations, for our ships to successfully compete with foreign ships. In short, the ship would have to be foreign-built, commanded, officered and manned by aliens, and the food scale made un-American—everything foreign and nothing American except the ownership—to command success. Then five per cent of the earnings would come to this country and 95 per cent would go to aliens—and that we are told is a solution of the American shipping question!

Still, again, we are told that the Merchant Marine Commission's shipping bill, which passed the senate on Feb. 14, 1906, and is now pending in the house, is in the interest of the ship building trust. There is no ship building trust in this country. Our ship yards are running under partial time, only; many are shut down, and all are losing money. None of their owners have, for many years, received a dollar of return upon their investments, while some have gone into bankruptcy, others have been reorganized, squeezing out their original stockholders, and others are on the verge of similar "reorganizations." We are told that it is only the greed of our ship builders which prevents them from building ships in this country for our foreign trade—that they are waiting for our government to help them out. That these ship builders would see their entire investment lost and themselves ruined, and that they could be induced to stand

unitedly in such a silly position is ridiculous upon its face; but these are but samples of the "arguments" that are used to defeat the shipping bill.

Again, we are told of the "shipping trust" that would be benefited by the passage of this bill. This is supposed to refer to the company that was financed four years ago by J. Pierpont Morgan, and which bought up 120 foreign steamships—mostly British—for which it paid upwards of \$100,000,000. The pending bill discriminates in favor of American vessels and against foreign vessels. The Morgan syndicate owns 120 foreign and about 10 American vessels. The bill would benefit 10 and would injure 120 of their ships. There is no chance of the foreign ships becoming American, because their owners have entered into a formal agreement with the British government whereby they agree to keep the British ships British for twenty years, and to have Britons command and officer them, and, to the fullest extent possible, man them; and that all of these officers and as many as possible of the men shall be members of the British royal naval reserve.

We are told that Great Britain does not subsidize her ships, and yet she pays between \$7,000,000 and \$8,000,000 a year in various ways as aids to her merchant ships, in mail subsidies, naval reserve retainers, and admiralty subventions. The British government loaned \$13,000,000 for twenty years, at 2¾ per cent interest, to the British Cunard Steamship Co., a British line that has been subsidized for sixty-seven years. In addition to the loan, it agreed to pay the line \$1,090,000 a year for twenty years in mail subsidy and admiralty subvention, aside from what its officers and men receive as members of the British royal naval reserve.

It is said that Great Britain's great growth in shipping is the result of her "free ship" policy—her policy of admitting foreign vessels to British registry, whereas in no year have the foreign-built vessels placed upon the British register equaled one per cent of the British-built vessels so registered. British shipping has not grown as a result of the British free ship law. But, in the contract with the

Cunard company, it was stipulated by the government that the new ships should be "built in the United Kingdom."

It is said that the nations that give subsidies, bounties and other aids to their shipping amount to nothing. The successful maritime nations are the ones that give this aid. Upwards of \$28,000,000 a year is paid by foreign governments in subsidies, bounties on construction and navigation, naval reserve retainers, and admiralty subventions. There is not a nation, today, which does not aid its shipping that possesses a shipping worth speaking of.

It is obvious that unaided American ships cannot successfully compete with subsidized and bountied foreign ships, in our foreign carrying trade; that our government must do as other governments do in order to have an American merchant marine; that a merchant marine, according to the evidence of our leading army and naval officers, is essential to the national defense, and that it should be at least four or five times larger than it is now for national defense purposes, when needed, alone. It has been shown that by combinations between foreign shipping lines, now monopolizing our trade, as for instance between the United States and Brazil, agreements to put up the rates on our exporters has cut down our exports by one-third what they were a few years ago; that Secretary Root could not obtain a letter from home, after he left Brazil, on his recent South American tour, until he had reached Lima, Peru, on the west coast, near to Panama. And this was due to the infrequency of communication between South American republics and the United States, as a consequence of which our foreign trade is trifling.

These are a few facts that honest American newspapers should be informed of, and that they should use in discussing the American shipping question. They should not, as a few free trade newspapers in this country do, keep using the arguments that are advanced by foreign ship owners, foreign ship builders, their agents and representatives in this country, as to how to build an American shipping in the foreign trade; they should "beware of the Greeks, even when bearing gifts."

## AROUND THE GREAT LAKES.

The steamer Wm. Fitzgerald left the Wyandotte yard on her maiden trip on Oct. 11.

Donald McLean has been appointed receiver of the Chicago & Milwaukee Transportation Co.

The directors of the Cleveland & Buffalo Transit Co. have declared a quarterly dividend of 1¼ per cent, payable Nov. 1.

The steamer State of Ohio which was stranded on Rattlesnake island has been taken to the yard of the Toledo Ship Building Co. for repairs.

J. P. Manning Jr., foreman on the Pittsburg Coal Co.'s car dump at Ashtabula, is on the sick list. His place is being filled by Charles H. Irwin.

John Schei, oiler, and Peter Peterson, watchman, on the steamer Alexander McDougall expect to spend the winter months at Romstalen, Norway.

Wrecking master Harris W. Baker has succeeded in raising the tug Balize, sunk in little Detroit passage, Georgian bay, some time ago.

Last week, at Ashtabula, there were four Williams loading coal at the river car dumps at the same time. The Wm. L. Brown, Wm. A. Paine, Wm. Edwards, and Wm. S. Mack were all lined up for cargoes.

A libel of \$126,473 has been filed on the steamer Uranus, of the Gilchrist fleet, by the Rutland Transit Co. for sinking the steamer Gov. Smith in Lake Huron, Aug. 19.

The Canadian steam barge City of New York, owned by George Wilkinson, has been sold at sheriff's sale at Sarnia to Joseph Glass for \$2,000. The barge has been tied up at Sarnia for some time.

Capt. E. O. Whitney, who was transferred from the steamer John Ericsson to the Samuel F. B. Morse, was presented with a silk tile on his first trip in to Two Harbors by his numerous friends at that port.

The westerly bank of the channel at Ballard's Reef just above Lime Kiln crossing is now marked with five buoys. The channel is now buoyed on both sides and lighted at night, and masters may use full 600 ft. width without fear.

George H. Banks, United States junior engineer, stationed at Houghton, has finished taking soundings along the channel and down Portage river as far as the entry. He says there is plenty of water for the largest carrier loaded.

The steamer Nyack, owned by the Crosby Transportation Co., is to be rebuilt. All upper works from the bulwarks are to be new and it is intended to build a large double-deck

cabin with 100 staterooms, an increase of 40 over the present number.

The big iron steamer Vulcan, bound to Buffalo from Chicago, with a cargo of grain, shoved her bow into the rocks off Long Point in Lake Erie last Wednesday afternoon. It was necessary to lighter the cargo before the vessel was released. She was slightly damaged.

The steamers Charles Warner and Huron collided in the Cuyahoga river last week. The Warner was bound out and the Huron was leaving the Pennsylvania docks when the collision occurred. A couple of plates on the Huron's port bow were damaged.

James McCarthy, of Amherstburg, is second mate on the steamer William P. Snyder. Mr. McCarthy is a brother of Capt. John McCarthy, of Sandwich, and Capt. Dan McCarthy, who now lives in the east. Pat McCarthy, mate on the City of Bangor, is also a brother of his.

John N. Chapman, chief engineer on the steamer Edwin F. Holmes, is the proud possessor of a pair of white rats and one little one, which he carries aboard with him. In attempting to pick up the little one recently, the mother gave him a nip on the index finger which brought tears to his eyes.

Capt. J. S. Moore, of Port Huron, loaded the old steamer Havana with coal at Ashtabula Monday. The Havana has been sold by D. W. Mills, of Marysville, to the Erie Coal Co. She will trade in coal and pulp wood from Belleville and Kingston, Ont., to Erie, Pa. The Havana is an old flagship of the lakes.

Capt. James Sheehan, of Detroit, has purchased from the underwriters the wooden steamer B. Swain and will operate her in the general trade next season. The Swain was formerly owned by the Gilchrist Transportation Co. but was turned over to the insurance companies when she sank at Duluth two years ago.

Supt. W. L. Mercereau, of the Pere Marquette railroad, has chartered the car ferry Pere Marquette No. 16 to the Lake Michigan Transportation Co. to take the place of the car ferry which was lost at Chicago recently. Pere Marquette No. 16 is a four-track wooden ferry and was formerly known as the Muskegon.

Capt. John C. Pringle, of the steamer Isabell Boyce, which arrived at North Tonawanda last Thursday with lumber of McLean Bros., is endeavoring to learn of the whereabouts of Thomas Gelnaw, of St. Clair, Mich., who left the steamer six weeks ago and has not been seen since. He had \$87 in money and Capt. Pringle believes the man met with foul play.



#### FOUR LAUNCHINGS.

The American Ship Building Co. made a record on Saturday last by launching vessels at four of its yards. Three of the vessels were freighters and one a car ferry. The car ferry steamer Ann Arbor No. 4, building for the Ann Arbor Railway Co., was launched at 2:30 Saturday afternoon at the Cleveland yard, and was christened by Miss Virginia Lamprey, of Toledo. Mr. C. P. Lamprey, general traffic manager of the road, represented the owners at the launching. The new car ferry is 270 ft. over all, 259 ft. keel, 52 ft. beam and 19 ft. deep.

expansion, with cylinders 24, 39 and 65-in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 16 ft. diameter and 11½ ft. long, fitted with Ellis & Eaves draft and allowed 170 lbs. pressure. Capt. John Lowe will be master of the new steamer, which will come out next month.

The steamer James S. Dunham, building for the Chicago Navigation Co., of which Capt. Dennis Sullivan is manager, was launched at the Bay City yard and was christened by Mrs. Dunham, widow of the late James S. Dunham. This steamer is one of the smallest now un-

ters and 10 ft. 6 in. wide fore and aft. She will be built on the arch girder system with arches every 12 ft. There will be seven bulkheads in her, the center bulkhead being water-tight. Her water bottom will be 5 ft. 6 in. deep, but she will not have a hopper bottom. Mr. Robert Curr, naval architect, of Cleveland, will superintend the construction of the steamer for the owners.

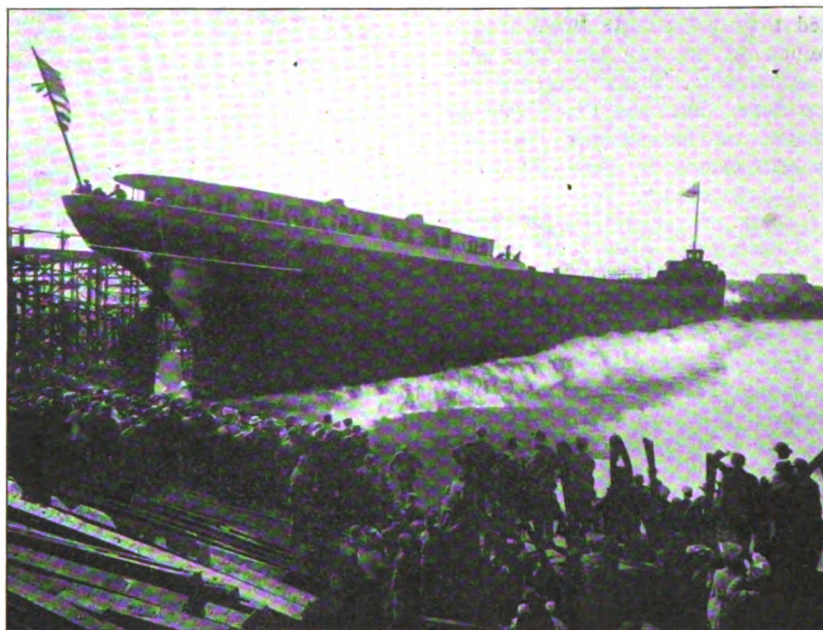
#### MORE LAKE CONTRACTS.

Additional contracts have been closed for vessels by lake ship builders during the past week. Mr. James C. Wallace, president of the American Ship Building Co. closed a contract with Michigan parties for a steamer to be a duplicate of the Harry Coulby, which was built during the present year for the United States Transportation Co. This new steamer will therefore be 569 ft. over all, 549 ft. keel, 56 ft. beam and 31 ft. deep, and will be equipped with triple-expansion engines and Scotch boilers. Mr. Wallace also closed contract with John H. Walsh, of Detroit, for a steamer to be a duplicate of the W. G. Pollock, being 440 ft. over all, 420 ft. keel, 52 ft. beam and 28 ft. deep. Her engines will have a stroke of piston two inches greater than that of the Pollock, but in all other respects they will be similar. They will be 22, 35, 58-in. cylinder diameters by 42-in. stroke. Her boilers will be 13 ft. nine inches by 11 ft. six inches.

Mr. Wallace also closed contract with the Anchor line for a steamer to be a duplicate of the package freighter Muncy. The new steamer will be 350 ft. long, 46 ft. wide and 30 ft. deep. She will have quadruple-expansion engines, with cylinders 19, 27, 40 and 58-in. diameters by 42-in. stroke. She will have three Scotch boilers, 11 ft. six inches by 11 ft. six inches. Other contracts are pending.

Mr. Antonio C. Pessano, president and general manager of the Great Lakes Engineering Works, Detroit, closed contract with the Rutland Transit Co. for two package freighters to be duplicates of the Rutland and Ogdensburg. These steamers are of Welland canal size and are 256 ft. over all, 242 ft. keel, 43 ft. beam and 26½ ft. deep.

Mr. Pessano also closed contract with the Western Transit Co., of Buffalo, for a package freighter to be a duplicate of the steamer Duluth. She will be 381 ft. long, 50 ft. wide and 30 ft. deep. She will have quadruple-expansion engines, with cylinders 20¾, 30, 43½ and 63 in. diameters by 42-in. stroke. Steam will be supplied by three Scotch boilers, 12 ft. six inches by 11 ft. six inches, 210 lbs. pressure.



LAUNCHING THE STEAMER DAN R. HANNA AT LORAIN.

Her engines are triple-expansion, with cylinders 14, 22½ and 38-in. diameters by 32-in. stroke, supplied with steam from two Scotch boilers, 12 ft. 10½ in. diameter by 13 ft. long.

The bulk freighter D. R. Hanna, building for the Pioneer Steamship Co., of Cleveland, was launched at the Lorain yard at noon, and was christened by Mrs. Walton McGean, wife of the well-known member of the firm of Hutchinson & Co. The Hanna is one of the largest carriers on the lakes, being 552 ft. over all, 532 ft. keel, 56 ft. beam and 31 ft. deep. She will have triple-expansion engines, with cylinders 23½, 38 and 63-in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 14½ ft. diameter and 11½ ft. long, fitted with Ellis & Eaves draft and allowed 180 lbs. pressure.

The last of the quartette of 600-footers to be built this season for the Pittsburg Steamship Co., the Peter A. B. Widener, was launched at the South Chicago yard at noon and was christened by Mrs. Redmond B. Stevens. The Widener is 600 ft. over all, 580 ft. keel, 58 ft. beam and 32 ft. deep. Her engines are triple-

der construction on the lakes, being 440 ft. over all, 420 ft. keel, 52 ft. beam and 18 ft. deep, equipped with triple-expansion engines, 22, 35 and 58-in. cylinder diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 13 ft. 2 in. diameter and 12 ft. long, fitted with Ellis & Eaves draft and allowed 170 lbs. pressure.

#### CANADIAN BULK FREIGHTER.

The Chicago & St. Lawrence Steam Navigation Co., Toronto, have given a contract to the Canadian Ship Building Co., for the construction of a bulk freighter to be 510 ft. over all, 500 ft. keel, 56 ft. beam and 31 ft. deep, to be equipped with quadruple-expansion engines and Scotch boilers. The steamer will be constructed at the company's Niagara ship yard. This vessel will be unusually heavy and will have as much steel worked into her as is put into a 550-footer. She will have a lower stringer 5 ft. below the spar deck extending from the hatch opening to the ship's side, and a girder of that depth connecting the two stringers in line of hatches. The hatches will be 24 ft. cen-



# Ohio Valley Improvement Association Convention.

The twelfth annual convention of the Ohio Valley Improvement Association which was held at Portsmouth, O., on Oct. 17 and 18 marks a new departure in the history of the movement which this association stands for.

Those who have watched the work have seen it rise from a small beginning to the present important position which it occupies in the minds of the thoughtful manufacturers and business men of the Ohio valley. It has come to be lately more and more recognized that transportation is one of the inherent sources of national wealth, as much to be reckoned with as climate, fertility of soil, and agricultural and manufacturing products. We quote the following from the official call for this convention.

"The question that this association will deal with is the improvement of the Ohio river, which spells transportation — cheap and reliable; and the question of transportation is the most important one before the people of this country and of the world. Whatever affects the transportation facilities of the great valley of the Ohio touches its economic life at the very center.

"The Ohio river improved (and that is what you are asked by this call to lend your aid in bringing about) will give to all people of the valley cheap rates on its waters, and serve as a regulator of railroad rates for hundreds of miles of territory on each side of its banks. You are interested.

For twelve years the Ohio Valley Improvement Association, aided by the moral and financial support of public-spirited citizens of all the states and sections of states that border the entire length of the Ohio river, has labored unceasingly for a just recognition by congress of the importance of the river to the welfare of the people of the valley, which is rightfully known as the workshop of the United States. That recognition was practically accorded by the Fifty-eighth congress, which, in the rivers and harbors bill passed by it, gave great prominence to the Ohio river.

Under the provisions of this bill there was appointed a board of U. S. engineers to complete the survey of the river and to report at the earliest possible moment its findings as to the

feasibility of improving the river, on the basis of a six and of a nine-foot stage. This board has practically completed its work, and it is expected that its report will be submitted at the next session of the 59th congress."

For several years after the inception of the Ohio Valley Improvement Association many of those who had directly to do with the movement failed to recognize its full and broad significance. It was thought to be as was once said of the protective tariff system, merely a local issue affecting only the interests of river men. The more far-sighted of the original members of the association, and pre-eminently among them Col. John L. Vance, the president of the association, took a wider view, and believing that the object sought would contribute not alone to the prosperity of the states bordering on the Ohio river but affect even the remotest confines of the whole country, they began by steady and persistent work to convert the business and manufacturing interests of the whole country and through them their representatives in congress to the belief that cheapened transportation throughout the Ohio valley would benefit it all. The band of workers at first numbering but few, gradually increased, until at present there is no community in the Ohio valley where this organization is unknown and where its work is not approved. Within the past three or four years the congress of the United States has come to fully appreciate the situation, and valuable work has been done and appropriations secured. These have but served to increase enthusiasm and interest, and the efforts already made will be from this time on redoubled and pursued with unflagging industry.

The movement has passed the stage of education. Its importance is now recognized on all hands. Its leaders are now more concerned with the question of how best to consolidate the efforts of all those who are engaged in similar enterprises throughout the country. The past few years of prosperity in the United States have fully demonstrated the insufficiency of the railroads to handle the traffic, and even railroad magnates are now willing to concede that the improvement of water communication

cannot injure the railroads since it will so stimulate and increase the aggregate of production, that the railroads would make more money in transporting the higher class freight, leaving the transportation of raw materials to the waterways.

The meeting at Portsmouth then, while it has added no new light so far as a realization of the urgent need and great value of the improvement of water transportation is concerned, has served to accentuate the feeling which has been growing of late that all those seeking for appropriations from congress must come to a harmonious agreement among themselves before they can hope to obtain the best and most favorable action by the rivers and harbors committee of the national congress.

During the two half days and one night session of the convention at Portsmouth, notwithstanding the illness of President Vance, who has been the forefront of the movement, and who was only able to attend during part of the time, under the chairmanship of Mr. Albert Bettinger, of Cincinnati, a great amount of business was pushed through and much good work done.

The convention was called to order by Mr. J. E. Williams, chairman of the local committee, at one o'clock, Wednesday afternoon, and after prayer by Rev. S. B. Alderson, D. D. Hon. A. L. Harris, governor of Ohio, in behalf of his state gave welcome to the convention.

The governor congratulated the association upon the able presentation of its case to the congressional committee, through which they were induced to make a personal inspection of the river from its source to its mouth, believing that the cause had thereby much advanced. He urged them to continue their efforts until a nine-foot stage from Pittsburg to Cairo shall have been established. Governor Harris insisted that in no other manner could the movement so well contribute to the substantial happiness and prosperity of all the people than by a liberal treatment of our waterways. Western Pennsylvania, West Virginia, Ohio and Kentucky originated and moved more tonnage than any similar area in the world; more than the annual tonnage of New

York, London, Liverpool, Antwerp and Hamburg combined—more than the annual tonnage of New York, Boston and Baltimore; all of which tonnage is of such magnitude and character as to be vitally affected by transportation conditions.

Following Governor Harris, graceful speeches of welcome were made by Hon. Wells A. Hutchins, mayor of Portsmouth, and Hon. H. S. Grimes, president of the board of trade.

Hon. Samuel J. Flickinger, secretary to the governor of Ohio, was to have delivered the welcome of the press to the convention, but was compelled to leave for Marietta immediately after the delivery of the governor's speech.

Owing to the illness of Col. Vance he requested Vice President Albert Bettinger, of Cincinnati, to respond to the addresses of welcome and also to preside over the convention during the remainder of its sessions.

No more fitting choice could have been made, as Mr. Bettinger in addition to a fine presence and complete self-possession on the platform, is thoroughly informed on all matters referring to river improvement and has been long identified with this movement.

Mr. Bettinger introduced Hon. George Guthrie, mayor of Pittsburg, to whom he referred as a man who had not sought office but upon whom office had fallen because of his pre-eminent qualifications and well known position with reference to civic righteousness irrespective of politics.

Mayor Guthrie touched upon the importance to commerce from the most ancient times of ample transportation facilities, and showed how communities when deprived of these facilities languished and died. He said that only water transportation can give absolute security and assurance of fair and equal rates at such minimum cost as is essential to open competition by American products in the markets of the world. He insisted that the interior must have unobstructed waterway communication with the Gulf of Mexico on the south and through the Panama canal to the orient, and closed with an appeal for an enlightened, liberal and progressive policy of internal waterway improvement.

Chairman Bettinger in introducing Mr. William K. Kavanaugh, vice president of the St. Louis Business Men's League, referred to the fact that there are other projects of a similar nature to that of the improvement of the Ohio river, and it was the province of the speaker whom he in-

troduced to acquaint the convention with something of what was being done elsewhere, and especially at St. Louis.

Mr. Kavanaugh presented an invitation to the members of the association to attend the convention of the deep waterways convention, to be held at St. Louis on November 15 and 16. He also referred to the work of the National Rivers and Harbors Congress, and endorsed the position taken by the Hon. J. E. Ransdell, of Louisiana. He said that a paltry \$19,000,000 per annum is entirely inadequate and insufficient for the improvement of our waterways, and advocated that a continuous and regular appropriation be made and expended in a careful, business-like, judicious and effective manner, as being the only way to secure results. He assured the convention that although St. Louis was deeply interested in the improvement of the upper Mississippi, it is in no wise jealous of the movement to improve the Ohio and will at all times be ready and willing to assist. Acceptances for the waterways convention in St. Louis in November have been received from over 900 delegates, 70 congressmen, eight senators and ten governors from the various cities bordering on the Mississippi valley.

By special vote the convention sent a telegram of sympathy to Colonel E. P. Wilson, of Cincinnati, for some years secretary of the association, who is now on a bed of sickness.

Secretary Ellison read President Vance's annual report, as follows:

#### PRESIDENT'S ANNUAL REPORT.

The last general appropriation by congress for rivers and harbors was the act approved by the president on the third of March, 1905. As a consequence, no appropriations for new work were made at the first session of the present (the 59th) congress. Had a bill been introduced at the last session of congress, no effort would have been made to secure appropriations for new work on the Ohio river, for the reason that the board of engineers, authorized by congress and appointed by the secretary of war, was, and is now, engaged in completing the survey of the river, covering its entire length from Pittsburg to Cairo. It would have been manifestly inadvisable, as well as futile, to attempt to secure appropriations until after the filing of the report of this board.

It is gratifying to say, however, that the sundry civil bill, passed at the first session of the fifty-ninth congress, contained all appropria-

tions required for the prosecution of work heretofore authorized on the Ohio river and its tributaries. This work, at all points, has been pushed forward as rapidly as possible.

#### THE BOARD OF ENGINEERS.

In my report to the Cairo convention, a full statement was given in regard to the duties of the board. I again name the officers composing the board, for the reason that frequent inquiries are received as to who compose its membership: Lieut.-Col. D. W. Lockwood, Lieut.-Col. E. H. Ruffner, Lieut.-Col. Clinton B. Sears, Maj. Geo. A. Zinn and Maj. Wm. L. Sibert. Capt. Harry Burgess is the executive and disbursing officer of the board, and has had charge of the survey, the work of which has been prosecuted thoroughly and as rapidly as possible.

#### SURVEY OF THE OHIO RIVER.

The field work of this survey has been completed, and it is expected that the mapping will be completed on or about Nov. 1, 1906. The board of engineers, constituted by congress, will in all probability, submit its report on or about Dec. 1, 1906, or at least not later than Jan. 1, 1907, thus enabling the present congress to consider the question of improving the Ohio river, making a nine-foot depth from Pittsburg to Cairo, having before it all available data.

The work by the Ohio Valley Improvement Association of securing commercial statistics and opinions of prominent shippers and manufacturers along the Ohio valley, for the use of the board, has been completed, and the results placed in the hands of the board. It would not be proper for the association to make public this work, as it will form a part of the report of the board and congress should be the first party to receive information.

#### STATISTICS.

The securing of these statistics has been the most important work of the association during the past year. It embraced the present tonnage, and estimates as to the probable tonnage an improved condition and dependable navigation would bring.

This work was undertaken, as you know, at the request of the Ohio River Board of United States Engineers, appointed by the secretary of war in compliance with a provision in the rivers and harbors bill, reported to, and made law by, the fifty-eighth congress.

Immediately following the adjournment of the eleventh annual convention, and carrying out the instructions

there given by resolutions, your officers began work to secure and compile all available and necessary data.

A commissioner was employed and put in the field, beginning at Cairo. Every town, city and landing along the river was visited. Receivers and shippers of freight at all points were interviewed, their signed statements secured, the prominent manufacturers and merchants of each locality were also interviewed, and when possible a letter was secured, giving the opinion of the writer as to the bearing upon his particular business and the business generally of his locality, the river in an improved state would have.

The only exceptions concerning the points visited by our commissioner from Pittsburg to Cairo were the cities of Louisville, Cincinnati, Wheeling and Pittsburg. These important cities were, by resolutions of the Ohio river board (and it is proper to say here that every instruction or suggestion coming from that board was cheerfully carried out by the officers of the association), divided among the officers of the board. Pittsburg and its immediate district was allotted to Major Wm. L. Sibert; Wheeling and district adjoining to Major George A. Zinn; Louisville and adjacent territory, Capt. Harry Burgess; Cincinnati and district near by to J. F. Ellison, secretary of the association, in whose direct charge has been all the work committed to the care of the association, and it is pleasant to advise you that this work was done in such a manner as to merit the approbation of the Ohio river board as expressed in a resolution at their meeting held at Cincinnati on Tuesday, Oct. 2, thanking Secretary Ellison and the Ohio Valley Improvement Association for the work performed. At this meeting was delivered to the statistics committee of the board figures of the tonnage movement secured by the association, carefully compiled and tabulated by states, cities, towns and landings, together with the original documents secured and all letters that had been received.

The total of the figures secured and delivered to the Ohio river board by your secretary on behalf of the association, cannot at this time, as heretofore stated, be made public. This is properly so, for the reason that your association was acting in the capacity of a sub-agent of the government, as represented by the board of army engineers, whose completed report will go through proper channels direct to congress. But of one

thing, and that the most important, you may be assured the report in its entirety, as finally submitted to congress, will bear strong and convincing testimony to every claim made by this association as to the value of the river to all sections of the great central valley of the middle west. It will show as great a tonnage in its unimproved state as its most sanguine friends have ever claimed for it, and will demonstrate beyond question that the improvement of the river, to which the government is already irrevocably committed, should be carried to a prompt and early completion.

It would not be proper for me to close this part of my report without a reference to the magnificent work of the statistics committee of the board of engineers, Major George A. Zinn, Major Wm. L. Sibert, and Capt. Harry Burgess. The work committed to them by the board has been performed with a degree of intelligence, care, and faithfulness of detail which would be expected from such officers and gentlemen, and which merits the approbation of every friend and supporter of the movement to improve the Ohio river. In my opinion this convention would be derelict in duty if it did not, before final adjournment, pass a resolution of gratitude to these gentlemen for the magnificent manner in which they have accomplished their most laborious task.

#### OHIO RIVER.

Of the work on the Ohio river from Pittsburg to Merrill Dam, making a depth of nine feet, locks and dams Nos. 1 and 6 are completed; lock and dam No. 2 are about completed, and it is expected that the machinery for this lock will be completely installed on or about Oct. 20, 1906. It is thought that locks and dams Nos. 3 and 5 will be completed this season, but it is doubtful whether lock and dam No. 4 will be completed this season.

The work was materially delayed during the season of 1905 by freshets. The river reached a stage suitable to ship coal every month during the year, and during some months, as much as three times. About two-thirds of the month of August of this year was lost on account of freshets. However, the hope of completing all of locks and dams Nos. 1 to 6 and making the change to a 9-foot depth during the years 1905 and 1906 will be almost accomplished.

When completed this improvement will enable boats drawing eight to nine feet to harbor in the lower pools, and especially in the pool below the

mouth of the Beaver river, from which pool, they can proceed south for 50 per cent more days than they now can, thus adding materially to the navigation season for the shipment of coal and heavier products south. The completion of these six locks and dams will also materially increase the length of the navigation season of the packets plying from the Muskingum and Kanawha rivers to Pittsburg and from Cincinnati to Pittsburg. The upper 30 miles of the Ohio river are the steepest and consequently the shallowest and most difficult to navigate.

The work at locks 8, 11, 13, 18 and 37 is progressing satisfactorily, considering the unusual amount of high water during the past two years. The locks at 8, 11, 13 and 18 are practically completed, and the dams at 13 and 18 are under contract and the work is progressing. A good start has been made on the lock at No. 37.

The land necessary for building lock and dam No. 7 has been procured and plans have been prepared for such lock and dam. Congress has not yet provided funds for construction.

Conditional appropriations have been made for locks and dams Nos. 19 and 26.

#### MONONGAHELA RIVER.

New lock and dam No. 2, Monongahela river, built at a cost of \$655,000, is now completed and in service. There are two lock chambers at this dam, which are wide enough and long enough to pass through at one lockage the average Monongahela river tow. The new lock 2 has four times the locking capacity of the old lock 2.

The work of rebuilding dam No. 3, Monongahela river, is progressing satisfactorily, considering the unusual amount of high water that prevailed during the season of 1905. The lock will be completed this fall. It being necessary to build the lock and dam in such a manner as not to interfere with navigation, it is feared that when the lock is completed the season will be so far advanced that there will not be sufficient time to complete the dam this year. The foundation for the dam is completed so far as it is safe to carry it without interfering with navigation. When the lock is completed and placed in commission work can be resumed on the foundation of the dam. There should be no trouble in completing the lock and dam next season.

#### ALLEGHENY RIVER.

Of the three locks and dams contemplated for the Allegheny river, Nos. 1 and 3 are completed and in commission. The lock at No. 2 is

completed and there is a fair chance of completing the dam this season. However, if it be a rainy fall the dam cannot be completed but it will certainly be finished during the season of 1907.

#### MUSKINGUM RIVER.

By the rivers and harbors bill enacted March 3, 1905, congress appropriated the funds required to build another lock and dam in the Muskingum, thereby proposing to extend the slack water of that river to a connection with the Ohio canal at Dresden. The land for the lock site has been purchased and the plans for the lock and dam are being made. Actual construction of the lock or dam has not yet been commenced.

#### LITTLE KANAWHA RIVER.

By authority of the last rivers and harbors bill, the government bought the property of the Little Kanawha Navigation Co., including the four old locks and dams between Parkersburg and Burning Springs, 40 miles above the mouth of the river, Nov. 1, 1905. By the same act as that authorizing the above purchase, congress appropriated about \$85,000 for the repair of the four old locks and dams. Lock No. 4 is now repaired and the old dam has been torn out and a new one will be completed before the end of this month. The government, therefore, now owns the five locks and dams on the Little Kanawha river, which give slack water from Parkersburg to Creston,—48 miles. The repair and rebuilding of the other three old locks and dams will be continued next season.

#### GREEN RIVER.

Lock and dam No. 6 on Green river, about two miles above Brownsville, have been completed, thereby extending slack water to Mammoth cave. No other new locks and dams are in progress.

#### BIG SANDY RIVER.

The work on this river is progressing satisfactorily.

#### OTHER TRIBUTARIES.

On all tributary rivers, not above named, progress is being made in the work of improvement, as rapidly as permitted by the stage of water obtaining during the past year.

#### LAKE ERIE AND OHIO RIVER SHIP CANAL.

The granting of a national charter to this project at the last session of congress by a large majority vote in both houses, and the approval of the President June 30, 1906, sets the seal of government approval on the enterprise, and now opens the way for its building in the near future.

The powers granted are vast and comprehensive and ample to work

out every detail of its financing, construction and operation. The interests of both investor in its securities and the shipper, are carefully safeguarded.

All friends of the Ohio river improvement are deeply concerned in the success of the undertaking, as it means the union of the great lakes waterway system, with an annual tonnage of over 50,000,000 tons, with the Ohio and Mississippi river systems, and connects the two on the Ohio at the mouth of the Beaver river by a navigable channel of at least 14 feet, as contemplated by the canal company.

The legislators at Washington, in considering this canal, realized its national importance, when twenty-four states would be provided with continuous waterway service, through this union of the great lakes and interior river systems; and they foresaw the immediate and imperative necessity following the building of this canal, to so improve the Ohio river to meet this new condition to allow lake commerce southern movement by the Ohio river, and to provide opportunity for a northern and eastern movement of the commerce of these rivers into the great lakes and thence via the enlarged Erie canal to the Atlantic ocean.

New York state is now enlarging the Erie canal at a cost of over \$100,000,000, and with the Lake Erie and Ohio river ship canal completed, there will be a navigable channel of at least 14 feet depth from New York city to the Ohio river at the mouth of the Beaver river.

It needs no argument to convince any one how this new condition will demand the immediate improvement of the Ohio river by the government to make it a modern servant of the new commerce this canal will provide for it.

The fear has been expressed that this canal would be controlled by interests unfavorable to water transportation, but assurance has been given by those who have its destiny at their command that such will not be the case.

The balance of President Vance's report dealing with the National Rivers and Harbors Congress will be published later in the REVIEW.

The following committees were appointed.

Committee on Resolutions:—Frank V. Knaus, chairman; D. J. Sinclair, W. H. Keller, W. W. Hite, W. A. Patton, W. B. Rodgers, Hon. Lynn Kirtland, B. B. Dovenor, George Parsons,

M. F. Noll, W. H. Williams, Chas. Muhleman, Jas. F. Brownski, Saunders Fowler, Col. F. B. Posey, Col. Thos. O'Brien, J. C. Hutsinpillar, R. B. Naylor, James T. McHugh, Thos. M. Rees, Edward Marmet, Gideon C. Wilson, M. F. Merriman, Clinton F. Rose, Edwin C. Gibbs, D. A. Mossman, A. W. Werniger, M. B. Farin, W. C. Williams, Hollie C. Johnston, Capt. T. T. Johnson, George W. Summers, J. N. Kehoe, George M. Appel, Fred Tuke, Jacob Sprengard, J. C. Van Pelt, Hon. John W. Boehne, Hon. H. A. Marting, Dr. J. H. Wade, C. M. Phister, T. J. Kenan.

Committee on Nominations:—H. T. Atkins, chairman, C. L. Smith, Capt. James Kirker, Theo. Mayer, Herry Manns, J. T. Lohney, Maj. D. E. Stalnaker, J. Will Gleichman, Maj. J. H. Ashcraft, M. F. Noll, Saml. Bailey, Dr. J. A. Lupton, Dr. A. Robinson, Mordecai Williams, H. H. Smith, John A. Jones.

Committee on Miscellaneous Business:—Will L. Finch, chairman, James I. Gorman, J. H. Long, D. F. Bryan, Edward R. Buhrman, Samuel Nieman, Ernest Schneider, John R. McCormick, S. T. Rickwood, Henry Petter, Wm. Bettinger, Samuel F. Bailey, Paris C. Brown.

The report of the secretary-treasurer by J. F. Ellison showed that the finances of the association were in a healthy condition, some \$10,000 having been expended during the year, and a balance on hand of over \$6,000.

Letters of regret were read from President Roosevelt, Chairman Burton, governors of states bordering on the Ohio, mayors of a number of large cities, and congressmen from Ohio river districts who were not in attendance, all of them manifesting great interest in the association and its objects.

A communication read from the American Merchants & Manufacturers' Association of Pittsburg urged the abolition of wharfage rates all along the Ohio.

At the Wednesday night session, which was open to the general public, as were all sessions of the convention, the grand opera house was packed to the dome, and although the meeting lasted until 11 o'clock, nobody left the house until the adjournment. The interludes between speeches were enlivened by vocal and instrumental music, the opening number being "America," which Chairman Bettinger announced with the remark that the "On to Cairo movement" was as national as the song. The music was rendered by a double quartet of male



voices, the audience joining in the chorus.

Hon. George M. Osborn, of Portsmouth, was the first speaker, who, referring to the problem of transportation as having engaged the attention of political economists for years, and of late arousing special interest among all classes, said that he was not one of those who believe in government ownership of railroads or other public utilities, but that until a practical and efficient plan of regulation of carriers' rates is consummated the government should maintain its control of the great natural highways of commerce, the navigable rivers; and government control should mean government care and development, the possibility of internal improvement being as old and well established as government itself. The improvement of the Ohio river means more than the commercial interests of the communities that line its banks and make up the six states that border upon it. In connection with the improvement of the Mississippi and its tributaries it means the commercial ascendancy of the whole Mississippi valley, and its direct communication with the markets of the world. It would mean as much to New Orleans as to Pittsburg, as much to Memphis as to Evansville; it means much to Kansas, Nebraska and the Dakotas as well as West Virginia, Kentucky and Indiana. It opens direct communication from the granaries and workshops of the richest region in the world.

In introducing the Hon. J. E. Ransdell, member of congress, of Louisiana, Chairman Bettinger referred to the National Rivers and Harbors Congress in the city of Washington in January last, whose chief object is to create and educate public sentiment throughout the country in favor of the improvement of rivers and harbors generally. The work of that association in the interim between meetings is committed to an executive committee, at the head of which was placed, Mr. Bettinger said, one of the most distinguished members of the congressional committee on rivers and harbors—Congressman Ransdell—who set about the task in a systematic manner and has succeeded in kindling a flame of interest in this subject from Maine to California, and from the lakes to the gulf.

Mr. Ransdell then addressed the convention and held the breathless attention of the magnificent audience for almost an hour, his delivery being at all times clear and distinct, his language ornate and his command of the

subject perfect. His reference to the trip down the Ohio by the rivers and harbors committee and the sentiment aroused for the canalization of the river was a beautiful piece of word painting, and put the audience in splendid humor for the salient features of the address. Mr. Ransdell's address covered practically the same ground as that delivered during the preceding week at Minneapolis and which will be given later in full in the REVIEW.

Hon. Swagar Sherley, congressman from the Louisville district, who has always been an outspoken friend of Ohio river improvement made a clean cut and forceful address. He ably seconded Congressman Ransdell's plea for co-operation among all improvement bodies of the nation. His unselfishness was proved, he claimed, when he did not insist upon the completion of the Louisville dam first, although its estimated cost is only \$216,000,000, but one-third the cost of the others. He believed that the whole stream should be improved at once.

Congressman Henry T. Bannon, of the Portsmouth, O., district, declared that he was so greatly in favor of the improvement of the Ohio river that he had personally prepared the plank in the platform of the Republican party in Ohio declaring in favor of liberal appropriations for the further improvement of the Ohio river. He would always continue to do everything within his power to forward this most beneficent work. He said that a Pittsburg company of gentlemen had asked congress to incorporate an association to be known as the Lake Erie & Ohio River Ship Canal Co., to construct a canal between Lake Erie and the Ohio river for the purpose of securing a better transportation rate of freight between those points. This bill had been referred to the congressional committee of which the speaker was a member, and had met with strenuous opposition from unexpected quarters. He had advocated the passage of the bill at all times, and hoped that the canal would now be built and that when built there would be no further complaint about freight rates between Lake Erie and the Ohio river. He thought that while railroads were the direct result of the labor and brain of mankind, the rivers were equally subject to improvement which can only be had by the expenditure of money and toil. The improvement of rivers is the true solution of the problem of railway rate regulation. The speaker had yet to meet a member of the

house of representatives who would say that he would not vote for more liberal appropriations in favor of the improvement of our rivers. Mr. Bannon paid a high compliment to the painstaking labors of the house committee on rivers and harbors, of which he referred to Mr. Ransdell as a valued member. He pledged his support in the future, as it has always been given in the past.

Mr. Harvey D. Goulder, of Cleveland, was next introduced by Chairman Bettinger. In so doing he said that one of the greatest transportation routes in the world is the system of great lakes in our own country connected with the Hudson river by the Erie canal, and that the improvement of the connecting channels and the harbors of those lakes have been one of the greatest factors in the development of the industrial resources of this country. Mr. Goulder having been identified with those improvements for many years, it was but natural when the National Rivers and Harbors Congress was founded in Washington last January that it should elect him as its president.

Mr. Goulder after voicing his appreciation of the compliment tendered him in electing him to the position mentioned by Mr. Bettinger, said that he had always been heartily in favor of river and harbor improvements of every character without regard to locality, upon precisely the same grounds that he had favored improvements upon the great lakes. He spoke of the time when the rate from Escanaba to Buffalo was \$7.50 a ton, and the fact that it is now a little more than 1-10 of that amount, as illustrating the cheapening of rates through water transportation. In eight months the tonnage through the Sault in 1904 and 1905 was three times greater than that through the Suez canal, and four times greater than the amount which Prof. Johnson estimates will pass through the Panama canal annually after it shall have been in operation for ten years. Rates of freight on the great lakes are about 1-10 of the average rail freight rate of the United States, and about 1-5 of the freight rate of the largest trunk lines. Mr. Goulder could see no excuse for a parsimonious and niggardly policy on the part of the general government with respect to the improvement of internal waterways. He urged that all interests combine and insist upon compliance by congress with their legitimate demands.

The exercises of the evening closed with a lecture with lantern slides, il-

lustrating the progress and character of the Ohio river improvement, and showing the manner of operating the various types of dams.

The final session of the convention was held Thursday morning. Officers were elected as follows:

John L. Vance, president; J. F. Ellison, secretary and treasurer.

Executive Finance Committee: — Edwin C. Gibbs, chairman; John L. Vance, J. F. Ellison, George Puchta, Albert Bettinger, O. F. Barrett, Paris C. Brown, J. T. McHugh, M. B. Farrin.

Vice Presidents:—W. B. Rodgers, Pittsburg, Pa.; Jas. A. Henderson, Pittsburg, Pa.; John H. Jones, Pittsburg, Pa.; Hullihen Quarrier, Wheeling, W. Va.; D. A. Mossman, Huntington, W. Va.; D. W. Peterson, Wheeling, W. Va.; George W. Summers, Parkersburg, W. Va.; Albert Bettinger, Cincinnati, O.; H. A. Marting, Ironton, O.; I. E. Williams, Portsmouth, O.; D. J. Sinclair, Steubenville, O.; W. W. Hite, Louisville, Ky.; W. A. Patton, Catlettsburg, Ky.; S. A. Fowler, Paducah, Ky.; W. C. Williams, Louisville, Ky.; F. B. Posey, Evansville, Ind.; M. C. Garber, Madison, Ind.; Chas. Hegewald, New Albany, Ind.; I. H. Odell, Evansville, Ind.; George Parsons, Cairo, Ill.; J. C. Willis, Metropolis, Ill.; J. F. Browninski, Joppa, Ill.; E. A. Smith, Cairo, Ill.

Wheeling, W. Va., Rochester, Pa., and Maysville, Ky., were contestants for the honor of next year's convention, the choice going to Wheeling.

The committee on miscellaneous business, Will L. Finch, chairman, among other matters reported, recommended that the executive committee be requested to consider the practicability of arranging for a course of illustrated lectures at various points, along lines similar to that given by Mr. J. Frank Tilley at the Wednesday evening session. They further expressed appreciation of the presence of so distinguished an array of official representatives of national, state and city governments, and returned thanks to the city of Portsmouth and to the local committees, and especially Mr. John E. Williams, general chairman, for innumerable courtesies and attentions.

The following resolutions were unanimously adopted:

The Ohio Valley Improvement Association, in its twelfth annual convention assembled at Portsmouth, Ohio, Oct. 17 and 18, 1906, submits for reaffirmation the declaration of principles approved by the association at its meetings in Parkersburg,

1902, Evansville, 1903, Huntington, 1904, and Cairo, 1905.

First:—We reaffirm as the sense of this association that the improvement of the Ohio river from Pittsburg to Cairo should be such as to provide a nine foot stage at low water for the completion of which we respectfully ask that all appropriations necessary be made at the earliest practicable time.

Second:—This association advocates that improvements of the Ohio river be made according to the report and recommendation of the United States engineers approved by the secretary of war and that when work is begun on a lock and dam it should be completed as expeditiously as possible.

Third:—Whereas the board of engineers heretofore appointed by the secretary of war to examine and report upon the whole subject of improving the Ohio river have not as yet completed their labors but will in all probability do so before the next meeting of this association, therefore, be it

Resolved: — That the president of this association be and he is hereby authorized when said report of the board of engineers shall be made to appoint from the vice presidents a committee of ten, who with himself shall in the name of and on behalf of this association take such action with reference to the same as may to them seem for the best interests of this association.

Fourth: — This association earnestly commends the work of the National Rivers and Harbors Congress, and heartily endorses the principles advocated by it, believing them to be for the welfare of the whole United States, and recommends that all municipalities and commercial organizations along the Ohio river join said congress and send delegates to its annual meeting in Washington, D. C., Dec. 6 and 7 next, and that the president of the Ohio Valley Improvement Association be authorized to appoint twenty delegates to represent this association at said meeting.

Fifth: — That this convention heartily endorses the purposes of the lakes to the gulf deep waterway convention soon to be held in the city of St. Louis; that the invitation extended by the Business Men's League of St. Louis through Mr. W. K. Kavanaugh, be accepted; that the president of this association be authorized to appoint delegates to represent the association at said meeting, and that each commercial body along the Ohio river be invited to send representatives to it.

Sixth: — That whatever scheme of

improvement of the lower Ohio may be adopted pursuant to the forthcoming report of the board of engineers, the locality below the mouth of the Green river and the locality between the mouth of Tennessee river and Cairo should be given preference.

Seventh: — Whereas, experience has shown that judicious dredging in time of low water has proved extremely beneficial to low water navigation, therefore be it

Resolved: — That we recommend a liberal use of dredges during those seasons when they can be used to the greatest advantage during the progress of the lock and dam construction.

Eighth. — Resolved, that this association renew its protest against the maintenance of narrow channel spans across navigable rivers.

That we petition congress to enact such laws as will effectually control the rebuilding of bridges to the end that in reconstructed bridges the obstructive features shall be eliminated.

That congress be requested to cause the removal of all artificial obstructions to the full and free use of the Ohio river and its navigable tributaries, to which end it is recommended that the laws of congress for the preservation of harbor lines be strictly enforced.

Ninth:—Resolved that this association recommend the maintenance by the government of an adequate force of engineers to be available for the prosecution of river and harbor improvements, to which end is suggested the appointment or employment of civil engineers from private life when necessary.

Tenth:—Resolved, that this association express their thanks to the committee on rivers and harbors for their careful and conscientious examination of the scheme for the improvement of the Ohio river as shown by their personal inspection of that river from Pittsburg to the mouth, at much personal inconvenience to themselves; and for the courtesy and kindness with which they have uniformly treated the representatives of this association who have appeared before that committee. We appreciate the great care and skill with which the engineers have dealt with improvements to the Ohio river. They have heretofore solved all problems presented with scientific accuracy, and have made no mistakes in the work heretofore done.

We desire therefore to express our confidence in and reliance on them for the knowledge we have not, and



our thanks for their faithful and valuable service.

Respectfully submitted,

F. V. KNAUSS, Chairman,  
GEO. W. SUMMERS, Secretary.

Interesting addresses were made by Mr. John A. Fox, field secretary of the executive committee of the National Rivers and Harbors Congress, who explained in detail the work accomplished during the past year in the direction of giving publicity to this movement; also by Rev. John McCarthy, of Huntington, W. Va., whose remarks treated on the subject of water transportation from its general economic standpoint.

On motion of Congressman Dovenor, of Wheeling, a telegram of greeting was sent to Col. D. W. Lockwood, U. S. engineer corps, and his associates in session at Louisville, Ky. The convention then adjourned.

#### NOTTINGHAM—CARNEGIE COLLISION.

The steamer Nottingham, up-bound with coal, and the steamer Carnegie, downbound with iron ore, collided at the dark hole near Sailor's Encampment in St. Mary's river. The Nottingham was badly damaged and will probably be out of commission during the balance of the season. She was cut clean through from the stem to the collision bulkhead and is almost as badly damaged as the steamer Eugene Zimmerman was when she was sunk by the Saxona.

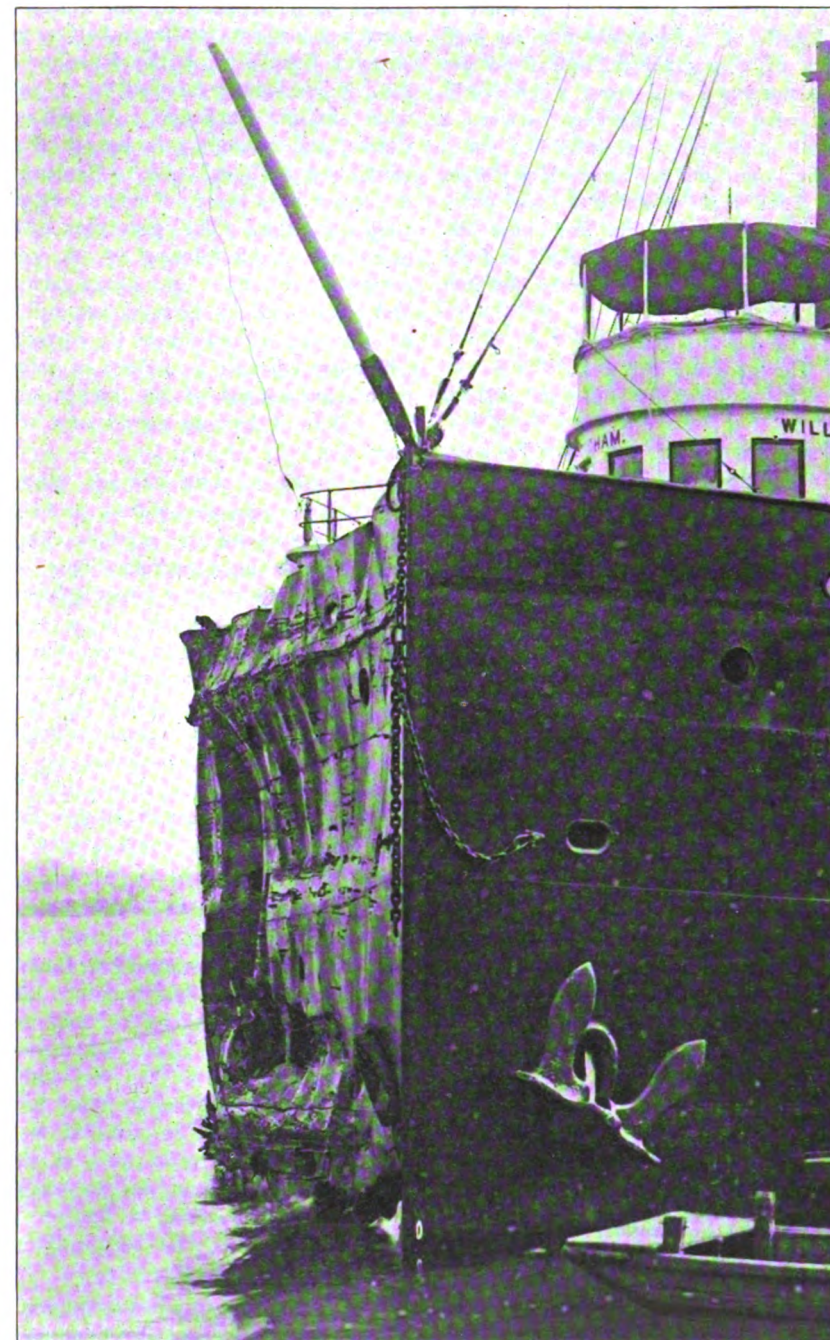
#### NEWS OF THE LAKES.

The schooners J. B. Comstock and Abram Smith, which broke away from the steamer Langell Boys in the storm in Lake Huron, are ashore on Duck island, sixty miles northeast of Thunder Bay island. The steering gear of the Langell Boys became disabled when the barges broke away and it was impossible to pick them up. The three boats were all lumber laden from Georgian bay and were bound for Bay City. The Smith and Comstock are owned by Eddy Bros. and John T. Ritchie, of Bay City.

The construction of a ship is not a maritime contract according to the United States district court at Chicago and the supreme court. A vessel, therefore, is not subject to libel because of faulty construction. The case was that in which the Graham & Morton Transportation Co. sought to libel the steamer City of Benton Harbor, built for it by the Craig Ship Building Co., because it failed to develop the contract speed of 18 miles an hour, and sought to garnishee the Indiana Transportation Co., which was indebted to the Craig Ship Building Co.

Steamboat inspectors Van Patten and Collins, of Milwaukee, have completed their investigation in the collision between the steamer Saugatuck and the tug J. W. Bennett on Green Bay, Aug. 18, and as a result have revoked the license of Pilot R. D. Baxter of this steamer and suspended that of Pilot Joseph Martell for a period of five

months. Investigation shows that Baxter was asleep in the cabin at the time of the accident. Martell testified that he saw the lights of the steamer but thought it far enough away to avoid danger. The tug was sunk by the collision and all efforts to raise her have failed.



SHOWING NOTTINGHAM'S CRUSHED BOW.

Two additional Hulett patented au-

Lorain curved dock to operate on any sized freighter likely to be built, that is, up to 60 ft. beam. The docks at Lorain are curved to such an extent that while the ends of a boat touch the dock the vessel amidships is a considerable distance away from it, thus necessitating longer reach in the unloaders.



# SCIENTIFIC LAKE NAVIGATION

By Clarence E. Long

## THE LAND AND THE SEA MILE.

Here is a subject that very few nautical men, as well as others, are perfectly familiar with, and that is, what is the length of a nautical mile as well as that of a geographical mile; how are each determined and from where reckoned; what is the difference between a nautical mile and a geographical mile; are they one and the same thing; what is a knot and what is a sea mile; what is a statute mile and how determined, and what is its length in feet?

There are three perfectly distinct kinds of miles:

1. The statute mile.
2. The geographical mile.
3. The nautical, or the sea mile or knot.

## THE ORIGATION OF THE STATUTE MILE.

The statute mile is the English and American standard of itinerary measure and was incidentally defined by an Act passed in the 35th year of the reign of "Good Queen Bess", as Lecky puts it, to be "8 furlongs, of 40 perches of  $16\frac{1}{2}$  feet," = 5,280 feet. This is purely an arbitrary measure, and has no connection with any scale of nature.

## THE GEOGRAPHICAL MILE.

The geographical mile is based upon the size of the earth, it being the length of a minute of arc of the earth's equator. Assuming the equatorial circumference to be 24,902.18 statute miles, = 131,483,510 feet and dividing by 21,600 ( $360 \times 60'$ ) we get 6,087.2 feet as the length of the geographical mile. From this you will see that the geographical mile is only of use on the equator, and no place else on the earth's surface; so bear this in mind and compare it with what is to follow.

## THE MILE EMPLOYED WHEN AFLOAT.

But on the high seas the navigator is not much concerned with either of the foregoing. When afloat he has only to deal with the nautical mile or knot, which depends for its length upon the shape as well as the size of the globe he sails over. In a general way we are accustomed to think of our turnip shaped planet as a true sphere, but if we go into close detail, the flattening at the poles and other irregularities of shape will not allow themselves to be slightly passed over as negligible quantities.

## THE POLAR FLATTENING.

The polar flattening was long looked upon as the only departure from the true sphere, but the elaborate investi-

gations of Col. A. R. Clarke, R. E., seem to show that the equator is not quite irreproachable in its rotundity, the excess of its longer over its shorter diameter being not far from half a mile. General Schubert, of the Russian survey, independently arrived at a somewhat similar conclusion. According to Clarke, the greater axis lies in  $8^{\circ} 15'$  west, and  $171^{\circ} 45'$  east of Greenwich, the lesser axis being, of course, at right angles to this. The distortion of the equatorial circumference is so small, comparatively, that its exact amount, and position of its vertices, are still under discussion and open to correction. Therefore, though a subject of interest to mathematicians of the higher order, for sailors it has no significance whatever.

## IRREGULARITY OF THE EARTH'S SURFACE.

It is quite possible—indeed, probable—that no section of the earth is either a perfect circle or a perfect ellipse, even when minor or contour irregularities are neglected. For example, in a 15-inch globe made correctly to scale, the flattening would only amount to 1-20 of an inch, a quantity which could not be detected without actual callipering, so that in sea-going practice we need not distress ourselves about this little eccentricity on the part of Mother Earth. Navigation is not an "exact science" and never will be.

## THE EQUATORIAL DIAMETER.

The earth's equatorial diameter may be taken at 7926.59 statute miles, and its polar diameter at 7899.58 statute miles; the compression is therefore 27.01 miles, or 1-293.5 of the equatorial diameter. This is rather more than has hitherto been accepted, Sir George Airy having put the compression at 26.5. If we reduce to inches the polar axis, as above, we get in round numbers 500,500,500—a curious combination of figures, very easily remembered, and sufficiently near the truth for most purposes.

## THE EQUATORIAL CIRCUMFERENCE.

The earth's equatorial circumference has already been stated as 24,902.18 statute miles, this, be it observed in passing, is the longest distance which can possibly be traveled in a direct line (great circle) over its surface. It is, however, the earth's meridional circumference which is responsible for the nautical mile or knot. (The equatorial circumference is the great circle passing around the equator in an east and west direction,

and the meridional circumference is the great circle passing around the earth in a north and south direction.) Taking the arithmetical mean of diameters previously given, this will be 24,859.7 statute miles, equals 131,259,216 feet, and these divided by 21,600 give 6076.8 feet as the measurement of the mean sea mile or knot. But why the qualification "mean" sea mile? Because, as will presently be shown, the sea mile varies with the latitude. Its length at the equator is 6040 feet, increasing to 6109 feet at the poles. According to these measurements the mean length of a knot would be 6077.5 feet against 6076.8 feet, the latter being based upon the mean diameters of the earth. The difference is not appalling, and as Lecky says, ships on the high seas are not navigated to yards, it is clear that the variation of the length of the nautical mile is of no importance to the sailor, further than if he "fancies himself" and wishes to be a cut above his fellows, he ought not only to be acquainted with the fact, but capable of giving an intelligent explanation.

We have already seen that a section of the earth in the plane of the meridian—instead of being a mathematically true circle—is somewhat oval (or elliptic) in shape. If the circumference of a true circle (a compass card, for example) be divided into 360 degrees, everybody knows that the length of each degree, or rather the space between each degree, will be the same to a hair's breadth; not so with the oval. As its radius of curvature is variable, increasing from the extremity of the major axis to the extremity of the minor axis, and as in consequence of this the direction of the vertical will not go to the earth's center, but meeting at various points, so on the earth's surface a degree of the meridian is found by geodetic measurement to increase from the equator to the poles.

## HOW IT IS DONE.

To determine the mean of polar and equatorial diameters, to ascertain the length of the mean sea mile or knot:

Polar diameter in miles.....	7899.58
Equatorial diameter in miles.....	7926.59
	2)15826.17
Mean of diameters in M....	7913.085
	3.1416
	47478510

7913085  
31652340  
7913085  
23739255

24,859.7478360

miles in mean circumference of earth.  
TO FIND THE CIRCUMFERENCE.

To find the circumference of a circle (the earth is a circle according to all practical purposes) multiply the diameter by 3.1416.

Mean cir. of earth.....24,859.7 miles  
Feet in statute mile.....5280

19887760  
497194  
1242985

131,259,216.0 ft.

in the circumference of earth.

$360 \times 60' = 21,600'$  131,259,216.0 (6076.8 feet  
129600 [in mean knot

165921  
151200

147216  
129600

176160  
172800

3360

HERE YOU HAVE IT IN A NUTSHELL.

A statute mile = 5280 feet.

A mean nautical mile = 6076.8 feet.

A geographical mile = 6087.2 feet.

A nautical mile, a sea mile and a knot = 6080 feet.

Although the nautical mile, the sea mile and the geographical mile get their lengths from a scale of nature their quantities depend entirely upon the arbitrary measurement of the statute mile. WHAT AUTHORITIES SAY ON THE SUBJECT.

Norie and others give the nautical mile a length of 6080 feet, but there are many works, and published by authority, that give it as 6075 feet. Others, again, place it at 6060 feet, while others again claim 6086 feet. The Standard dictionary, a work of recognized authority, gives the nautical mile a measurement of 2029 yards, equal to 6087 feet. From the foregoing it would seem that the nautical mile is rather an uncertain quantity, with no fixed number of feet, but a little thought and study on the subject will clear away the haze and unravel the tangle.

Bowditch, the American authority on practical navigation, gives the length of the nautical mile or knot, at 6080 ft., and it should be adopted by the navigator as such.

Now, 6080 ft. corresponds to latitude  $48^\circ$ , and these figures recommend them-

selves more particularly on account of being round numbers, and that is why it is used. Then, too, there is only a little better than 3 ft. difference between this and the length of the "mean" sea mile, or knot, which for all practical purposes are one and the same thing. The nautical mile is therefore 800 ft. longer than the statute mile.

The geographical mile and the nautical or sea mile or knot are often improperly taken to be one and the same thing, but the well-informed navigator makes a great distinction between the two for the reasons already given.

The Standard dictionary says a geographical mile is a nautical mile and vice versa.

Patterson says that a nautical or geographical mile is 6082.66 ft., which is another measurement for the nautical and the geographical mile. Here again the nautical and the geographical mile are used as meaning one and the same thing, which as you know is incorrect.

#### THE SEA MILE.

The sea mile derives its name from the fact that it is used on the sea.

#### THE KNOT.

The knot gets its name from the log-chip line knot, a distance depending for its length upon the number of seconds which the log-glass used measures. The principle of marking the log-line is that the length of each knot must bear the same ratio to the nautical mile that the time of the glass does to an hour. The log-glasses are usually 28 seconds and 14 seconds. Hence we get this proportion. As the number of seconds in an hour is to the number of seconds in the glass, so is the number of feet in a mile to the number of feet in the knot. Thus,

$$3600 \text{ sec.} : 28 \text{ sec.} :: 6080 \text{ ft.} : x = 47.29 \text{ ft.}$$

6080  
28  
-----  
48640  
12160

$$3600)170240.0(47.3 \text{ ft., or } 47 \text{ ft. } 4 \text{ inches.}$$

14400  
-----  
26240  
25200  
-----  
10400  
10800

If a 14-second sand-glass were used the length of a knot would be one-half of 47.29 ft., which is 23.64 ft., or 23 ft. 8 in.

#### THE SAND GLASS.

A sand-glass is an instrument for measuring time. It consists of a glass vessel having two compartments con-

nected by a glass tube, through which the sand runs from one compartment to the other, depending on which end of the glass is held upwards. A 28-second glass is so adjusted that it takes the sand 28 seconds to run from one compartment to the other. A 14-second glass requires half this time for the sand to run through, there being half the quantity of sand used. When all the sand has run through into one compartment, it is only necessary to turn this end upwards in order to use it again, and repeatedly.

#### THE LOG-CHIP.

The log-chip is a triangular piece of wood with a lead weight on one edge to make it float vertically instead of horizontally in the water. In each corner of the triangle a line leads to a point forming a bridle, to which the log-line is secured, on the same principle as the bridle of a kite. The leaden weight and the manner in which the bridle is adjusted causes the chip to resist being towed through the water; and on this account the chip remains stationary in the water and the ship leaving it astern the log-line pays out from the ship. It is the length of this line run out as timed by the sand-glass that gives the ship's speed at the time it was observed for.

#### HOW THE LOG-LINE IS MARKED.

The knots on the log-line are marked by thrusting pieces of fish-line through the strands, with one, two, three, etc., knots according to the number from the stray-line mark, which is a piece of red bunting. A piece of white bunting two inches long, marks every two-tenths of a knot. This is because the run of the ship is recorded in knots and tenths of a knot. The log-line is 150 fathoms in length, one end of which is made fast to the log-chip, the other to a reel upon which it is wound. The stray-line marked by the red bunting is from 15 to 20 fathoms long. The speed of the ship is estimated in knots and tenths of a knot.

#### HEAVING THE LOG.

One man holds the reel and another the sand-glass. The officer throws the log-chip over the ship's stern, and when he observes that the stray line is run off (when the piece of red bunting leaves the taffrail)—this distance being allowed to carry the log out of the influence of the ship's wake—he calls "turn;" the seaman upsets the glass and watches until the sand is run out, then calls "stop." The officer stops the line by a sudden jerk which pulls the plug out of its hole in the chip (one of the bridle lines) and so allows the log to float horizontally; then observes the number of knots, or marks, that have passed over the taffrail. The last knot shown indicates the number that has passed over



the taffrail during the time the sand ran through the glass. The knots and fractional knots give the speed of the ship in nautical miles. If  $10\frac{1}{2}$  knots on the log line had passed over the taffrail during the time the sand ran out the ship is making a speed of  $10\frac{1}{2}$  nautical miles an hour, no matter what the space between knots may be, so long as it conforms to the sand-glass employed.

TO DO IT ROUGHLY.

For roughly converting nautical miles or knots into statute miles, or vice versa, it is useful to know that 13 knots are near about the equivalent of 15 statute miles; then by simple proportion you can find the equivalent of any other number. Example:

How many statute miles in 20 knots? Proportion or Rule of Three (see chapter on proportion). As 13 knots is to 20 knots so is 15 statute miles to  $x$ , the unknown quantity, statute miles, or thus,

$$13 : 20 :: 15 : x = 23 \text{ knots.}$$

$$\begin{array}{r} 20 \\ \hline 13)300(23 \\ 26 \\ \hline 40 \\ 39 \\ \hline \end{array}$$

Example: How many knots in 19 statute miles? As 15 statute miles is to 19 statute miles, so is 13 knots to  $x$  knots.

$$15 : 19 :: 13 : x = 16.4 \text{ knots.}$$

$$\begin{array}{r} 19 \\ \hline 117 \\ 13 \\ \hline 13)247.0(16.4 \text{ knots.} \\ 15 \\ \hline 97 \\ 90 \\ \hline 70 \\ 60 \\ \hline \end{array}$$

Another way to do this when an epitome is at hand, is to open the traverse tables at  $30^\circ$ ; then against the knots in the latitude column will be found the corresponding number of statute miles in the distance column, and vice versa for statute miles.

TO CONVERT NAUTICAL MILES INTO STATUTE MILES AND STATUTE MILES INTO NAUTICAL MILES.

A nautical mile, or a knot or sea mile, contains 6080 feet, and a statute, or land mile, contains 5280 feet.

To convert nautical miles into statute miles, multiply nautical miles by the mixed number 1.15, because in one nauti-

cal mile there are 1.15 statute miles,

thus:  $\frac{6080}{5280}$  becomes an improper

fraction, and the rule to convert a fraction into a decimal, add ciphers to the numerator and divide by the denominator, whether a common or an improper fraction, as follows:

$$\begin{array}{r} 5280)6080.00(1.15 \\ 5280 \\ \hline 8000 \\ 5280 \\ \hline 27200 \\ 26400 \\ \hline 800 \end{array}$$

Now, this is a repeating decimal, but carrying it out to hundredths is sufficiently close for all practical purposes.

Convert 85 knots into statute miles, thus:

$$\begin{array}{r} 85 \text{ knots} \\ 1.15 \\ \hline 425 \\ 85 \\ \hline 85 \end{array}$$

97.75 the number of statute miles in 85 knots.

Question.—You have a patent log that registers nautical miles or knots, and a chart with a scale of statute miles on it; you have run 117 knots by log and you wish to prick, or lay this off on the chart, how many statute miles would you prick off? Answer  $134\frac{1}{2}$ .

Convert the following number of knots into statute miles.

$$108.5 \text{ knots} = 114.77 \text{ statute miles.}$$

$$84.75 = 97.46$$

$$14.25 = 15.38$$

$$17.8 = 20.55$$

$$29\frac{3}{4} \text{ knots} = 33.6 \text{ statute miles.}$$

Note.—Turn the common fractions in the above examples into decimals.

To convert statute miles into nautical miles, multiply statute miles by the decimal .87, because one statute mile is .87 of a nautical mile, or thus:

$$\begin{array}{r} 5280 \\ \hline .87 \text{ of a nautical mile, or thus: } \\ \hline \text{or } 6080)5280.000(.868 \\ 48640 \\ \hline 41600 \\ 36480 \\ \hline 51200 \\ 48640 \\ \hline 2560 \end{array}$$

This again is a repeating decimal. We call this .87 because .868 is practically .87 and it is a smaller denomination to multiply by, and is sufficiently accurate for all practical purposes.

It is 203 statute miles from Chicago to Pt. Betsey; you have a log that reg-

isters knots, how many miles should this log show in running from Chicago to Pt. Betsey Ans. 176.6 knots.

Now, we'll convert 10 nautical miles into statute miles, and then the statute miles back to nautical miles to prove the work, thus:

$$\begin{array}{r} 10 \text{ knots} \\ 1.15 \\ \hline 50 \\ 10 \\ 10 \\ \hline 11.50 \text{ statute miles.} \\ .87 \\ \hline 8050 \\ 9200 \end{array}$$

10.0050 knots.

You will see that this does not come out exactly, but .0050 of a mile is practically nothing. .87 always makes the conversion a little larger, and 1.15 a trifle less.

How many knots in 103 statute miles?

Ans. 89.6 knots; in 118.5 statute miles?

Ans. 103 knots; in 73.8 statute miles?

Ans. 64.2 knots; in  $43\frac{3}{4}$  statute miles?

Ans. 37.95 knots; in  $70\frac{1}{4}$  statute miles?

Ans. 61.1 knots; in  $38\frac{3}{4}$  statute miles?

Ans. 33.7 knots.

#### KNOTS AND MILES.

There is a growing practice says the *Yachtsman's Guide*, of making an improper use of the word knot, not only with the landsman, engineers and ship builders, but also with those who should know better. The prevailing idea appears to be that a knot is the same as the geographical, nautical or sea mile, and the word knot is used to prevent any possible confusion with the statute land mile. But this is quite wrong. The knot is the cosmopolitan unit of speed employed at sea by sailors of all civilized nations. One knot is a speed of one nautical mile an hour, the nautical being the mean sexagesimal minute of latitude on the earth's surface, so that it is  $90 \times 60$  equals 5,400 miles from the equator to the pole, and this is the only mile the sailor knows or uses. The nautical mile is a little over 6080 feet, the admiralty measured mile (we do not say admiralty knot), so that one knot is a speed of a little more than 100 feet in a minute, more nearly 101 to 102 feet in a minute; thus on a log line, with a half minute glass or interval of time, the distance between the knots should be 50 feet or a little over, say 51 feet.

The word knot is derived from knots on the log line, the number of knots that pass over the ship's taffrail during a half minute or other interval of time, giving the speed of the ship in knots. The only occasion then on which it is permissible to use the word knot as the equivalent of a length is in tracing the knots on a log line, and then, by familiar tendency in language, the "distance between two knots" is abbreviated in speech to the "length of knots." By a curious perversity and straining after precision, the incorrect expression "knots an hour," to express the speed of a ship, is creeping into general use, with the effect of displacing the words "mile by knot." No real sailor would say that a rock on land was half a knot, one knot, etc., away. It is too often urged that the expression "knots an hour" is so much clearer and definite; but we might just as well measure pressure in "atmospheres per square inch."

While there is much truth in the foregoing article, its author is splitting hairs over a question which has little concern for the navigator. He aims to explain that a knot is simply the "speed of (approximately) 101 feet in a minute." This is a ridiculous statement

for it does not convey the idea intended. What he should have said is this: For a minute interval the length between knots on the log line should be 101 feet, since their length varies with the interval of time employed.

As we have seen, the knot on the log line depends for its length upon the time interval employed, the length of the knot bearing the same ratio to the nautical mile as the time interval does to the hour. If the interval of time is 20 seconds the length between knots will depend upon the proportion existing between 20 seconds and the number of seconds contained in an hour. Hence, the length of a knot on the log line depends upon the time interval employed, since the number of feet in a nautical mile and the number of seconds in an hour remain always the same.

Supposing a vessel makes 10 nautical knots an hour, how many feet will she make in 30 seconds? Ten nautical miles equals 60,800 ft., divided by 3,600 equals 16.9 ft., nearly, per second, and in 30 seconds she would make 507 ft. In other words, if the time interval were one second, the length between knots would be 16.9 ft., and if the time interval were 30 seconds the length between knots would be 50.7 ft. At 10 nautical miles per hour the vessel would run 507 ft. in 30 seconds, or if the log-line were run out, 10 of its knots would pass over the taffrail in that time, and since one knot is equal to 50.7 ft. (in this case), 10 knots would be equal to 507 ft., which is at the rate of 10 nautical miles an hour.

Knowing the distance that the vessel runs per hour it becomes a very simple matter to get the length that would be between knots for a given time interval. Knowing the interval of time we can determine the same thing by giving the length of the knot on the log line its corresponding proportion.

The object of the log line with its knot divisions is to give the speed of the ship in (knots) nautical miles per hour, at once, for a given number of seconds, without recourse to any other figures. On board ship the length between knots of the log line depends upon the sand glass employed and they remain always the same so long as the same number of seconds glass is used.

If the ship made 10 nautical miles an hour, and we used an hour glass, the space between knots would be equal to one nautical mile, or 6,080 ft. 10 knots on the log line would pass over the taffrail during this time, but the log line would have to be at least 10 nautical miles in length.

The author of the above article admits that a knot is equal to a nautical mile, and so it is. If this be true why is it improper to use knot for nautical mile, or vice versa? The length of the

knot on the log line is a varying quantity, but not so with the knot, which is equivalent to a mean nautical mile. The convenience of using knot for nautical mile is to distinguish between the statute mile and the geographical mile. When it is said that a steamer makes 20 knots an hour, we know at once that nautical miles are meant—6,080 ft. to a mile. If it were said that a steamer makes 20 miles an hour, there would be no way of telling whether statute or nautical miles were meant. Knot is an abbreviation in speech for nautical mile. It is easier to say and print knots than nautical miles.

Steam navigation and the patent log have done away, to a large extent, with the chip log and the division of the log line into knots, notwithstanding that the chip log is as accurate, if not more so, than the patent log. So in truth there is little occasion for making the distinction between the length of knots on the log line and the knot itself.

In our navigation the knot or nautical mile is seldom employed. When we speak of miles the kind of miles should be mentioned, otherwise, we would take them as statute miles.

Again, if a ship were making 10 nautical miles an hour and a 28 seconds glass was used, the distance between knots on the log line would be 47 ft. 4 in.; if a 14 seconds glass were used their length would be just half of this, 23 ft. 8 in. In either case 10 knots would pass over the taffrail while the sand was running out of either glass. In the case of the 28 seconds glass twice as much of the log line runs out as when the 14 seconds glass is used, but as the distance between knots is twice as great, hence the equality.

The navy department in the trial speeds of its ships gives the speed in knots, and they do not mean log line knots either. It is nautical miles that is meant. In fact, all salt water navigation employs the knot to mean the nautical mile, or a length of 6,080 ft.

If a knot is equivalent to a nautical mile it is as correct to say 5 knots from the beach as 5 nautical miles, and there is more meaning to say 5 knots (if nautical miles are meant) than to say, simply 5 miles, since 5 miles could mean any kind of miles, but not so with the knot. The whole meaning is right in the word knot and there is no need of giving it any more explanation.

#### QUESTIONS FOR WHEELSMEN AND WATCHMEN.—NO. 16.

Question 104 is herewith given in somewhat different form for the sake of added clearness.

104. Tell how to navigate a boat from Marine City to the head of Stag island by either channel.

Give all principal shoals and landmarks passed on either hand.

In taking courses to make good their correct magnetic course take the mean of variations between the ends of each course.

161. How would you enter Presque Isle harbor with safety?

162. How is Spectacle reef south end shoal marked and what is the true bearing and distance from Spectacle reef lighthouse?

163. How is the 13-ft. shoal marked and what is the correct magnetic bearing and distance from Cheboygan lighthouse?

164. How is Cheboygan Pt. shoal marked and what is the true bearing and distance from Cheboygan lighthouse?

165. Entering Cheboygan river on which side do you leave Cheboygan crib?

166. How is Zella shoal marked and what is the true bearing and distance from Cheboygan lighthouse?

167. How is Major shoal marked and what is the correct magnetic bearing and distance from Round island lighthouse?

168. How is South Graham shoal marked and what is the true bearing and distance from McGulpin's Pt. lighthouse?

169. How is North Graham shoal marked and what is the true bearing and distance from Round island lighthouse?

170. How is the spit off the south point of Mackinac island marked and what is the true bearing and distance from Round island lighthouse?

#### QUESTIONS FOR OILERS AND WATERTENDERS.—NO. 11.

111. How would you find the H. P. necessary to elevate water to a given height?

112. By doubling the diameter of a pipe, how much will it increase its capacity?

113. What precaution would you suggest after doing any repair work to crank pins or pistons?

114. In pumping against a pressure would you advise a slow or fast piston speed?

115. What is the quickest and most reliable way to lay up a pump during freezing weather?

116. Ordinarily, how many gallons of water are required per H. P. per minute to condense steam?

117. In speaking of the pitch of a propeller, what does it refer to?

118. How would you proceed to find this pitch?

119. What is meant by real and apparent slip of a propeller wheel?

120. How would a steam boiler be

tested for strength, same to carry 210 lbs. per square inch?

#### QUESTIONS FOR MASTERS AND MATES—NO. 15.

220. Is it possible to have a magnet with only one pole?

221. Is the magnetism at the two ends of every magnet equal?

222. How could you determine (with compass and magnet) whether they were or not?

223. How could you determine the neutral line of a magnet?

224. Is the neutral line of a magnet always at the center of a magnet?

225. How do shocks cause and destroy magnetism?

226. How could you tell a good compass.

227. If you were to purchase a new compass what tests would you subject it to?

228. Are the magnetic poles of the earth points or areas?

229. How could you determine the location of the north magnetic pole?

230. Does the dipping needle show the same amount of inclination over the whole area denominated the magnetic pole, or is it just a spot where the dip is greatest?

231. What was the greatest amount of dip discovered?

232. Is the theory of magnetism identical with the earth's magnetism; that is, does the theory always prove in practice? Name one case where the two differ.

233. What is meant by the amplitude of arc?

234. What is the amplitude of arc from N to NNE?

#### ITEMS OF GENERAL INTEREST.

The French line is planning to build another steamer faster than La Provence.

The Auto Marine Co., of Detroit, has opened a New York office at 79 Cortlandt street.

The Tacoma Tug & Barge Co. has let contract to Crawford & Reid of Tacoma for the construction of six barges.

The steamer Havana, building at Cramp's ship yard, Philadelphia, for the Ward line, of New York, was launched recently.

Mather & Co., average adjusters and insurance agents at New York, have opened offices at Seattle, with Mr. Radcliffe Forman in charge.

The armored cruiser California, built at the yard of the Union Iron Works, San Francisco, Cal., will undergo her government trial in the near future.

The French line will run a bi-weekly service between New York and

Hayre next year. The new steamer to come out in 1907 will be named Chicago.

The steamship Mariechen now lying in the harbor of Seattle is a total wreck. After her engines are removed it is understood that she will be broken up and sold for scrap.

The city of Pittsburg is considering building a fireboat for use in Pittsburg harbor. Charles Rees, of James Rees & Sons, ship builders, is working on the plans.

The Brazos river navigation convention assembled at Navasota, Texas, Oct. 12. Much impetus was given at the convention to the movement to improve the navigation of the Brazos river.

The Seneca Chain Co., Kent, O., has purchased the plant of the American Chain Co., at Zanesville, O., and will at once begin the operation of the new branch, employing from 80 to 90 men.

The four-masted schooner Northland was launched from the yard of Cobb, Butler & Co., Rockland, Me., last week. She is equipped with a gasoline engine guaranteed to give a speed of six knots.

Capt. John H. Rinder, of the steamship Minnesota of the Great Northern Steamship Co.'s fleet, has placed his resignation in the hands of Mr. C. C. Lacey, marine superintendent of the company, as a result of friction aboard.

Arthur Hunt has been appointed Tacoma agent for the Taylor water-tube boiler. Mr. Hunt was one of the first men on Puget Sound to discover the merits of this type of boiler and installed one on the steamer Sentinel.

Edward Heath, Tacoma, Wash., is progressing favorably with work upon the West Seattle ferry. This ferry will be 160 ft. over all, 145 ft. keel, 32 ft. beam and 11 ft. 2 in. deep. Engines will be installed by the Heffernan Engine Works.

The MARINE REVIEW is lacking 1906 issues of the following dates: April 5, 12 and 19; May 3; June 21; July 19; Aug. 2, 9 and 16; Sept. 6 and 20. Any subscriber desiring to return these issues to the office will be given a generous extension of subscription.

The steamer Hendrick Hudson of the Hudson River Day line, designed by Mr. Frank E. Kirby, has logged 23.6 miles per hour, as shown by her Nicholson log, with her engines stiff from newness. It is expected that when she goes back on her route next May she will do better.

A report received at the department this week from the torpedo-boat destroyer Lawrence says that in recent practice she made nine hits out of nine shots. The boat was moving at ten knots' speed, with the target moving

at the same rate in an opposite direction, the distance being 1,000 yards.

All Pullman sleeping and parlor cars operating over the Lake Shore railway and other New York Central lines have been equipped with the Clelland patent paper ladies' hat bag for use in depositing and protecting ladies hats, veils, coats, etc., as well as gentlemen's silk hats, while enroute. These are furnished by porters in such cars.

Justice Keogh, supreme court, Brooklyn, has appointed Joseph J. O'Donohue Jr. receiver of the Brooklyn Ferry Co. in foreclosure proceedings instituted by the Knickerbocker Trust Co. on a mortgage of \$6,500,000. The ferry company is in default of the annual interest due on its mortgage which was payable August 1, last.

The steamer Gov. Cobb, equipped with Parsons turbines, underwent her builders' trial on the Hudson satisfactorily last week. The turbines were built and installed by the W. & A. Fletcher Co., Hoboken, N. J., and the hull was constructed at Roach's ship yard, Chester, Pa. The Gov. Cobb belongs to the fleet of the Eastern Steamship Co., of Boston, and will ply between Boston and St. Johns.

The Cunard line steamship Etruria and the Atlantic Transport steamship Minnehaha, both bound out, collided in the fog off quarantine last week. The Etruria had just dropped anchor when the Minnehaha coming up behind crashed into her port side. The steamer, however, was under slight headway and did no further damage than bending a few plates above the water line. The Etruria proceeded on her way to Liverpool as soon as the fog lifted.

The steamer Adirondack, of the People's line, and the Saratoga, of the Citizens' line, were in collision on the Hudson river, near Tivoli, during a dense fog on Oct. 13. The Saratoga, bound south from Troy, crashed into the Adirondack, bound north from New York, and tore away about 75 ft. of her lower deck on the port side forward of the wheel. Clarence Sherman, an oiler, was killed, but none of the passengers was hurt.

Announcement is made of the sale of the Hartford & New York Transportation Co. to the New York, New Haven & Hartford railroad. The former company controlled and operated a line of steamers between Hartford and New York, practically controlling coal transportation by barges. The company owned the two twin-screw steamboats Hartford and Middletown and twenty-four barges. It had a capital of \$500,000 and a bonded debt of \$200,000.



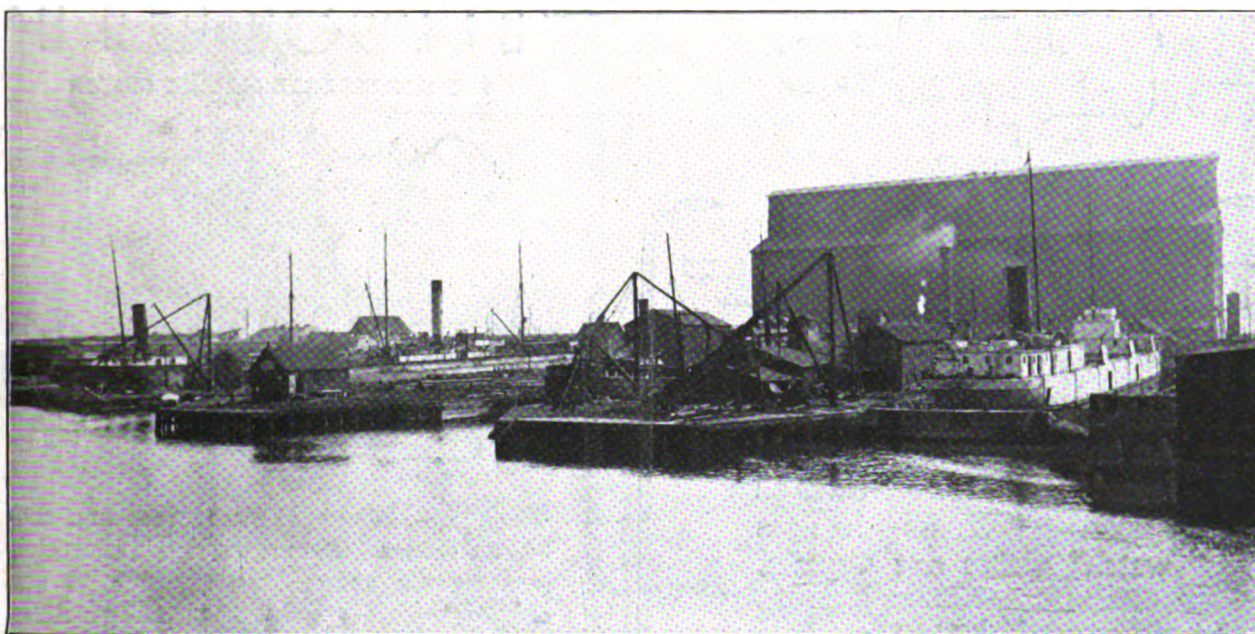
# THE MARINE REVIEW



VOL. XXXIV.

CLEVELAND, OCTOBER 25, 1906.

No. 17.



## ANNOUNCEMENT

¶ Our plant having been thoroughly reorganized both as to management and equipment, we are enabled to do all kinds of ship repairs at reasonable cost to the owners, whose patronage is solicited with the guarantee of satisfaction in all particulars.

¶ We call attention to our facilities for the construction of new vessels of all kinds, particularly dredging outfits, tugs, scows, fuel lighters, etc., plans for which we will furnish on application together with specifications and estimates of cost.

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Buffalo, New York

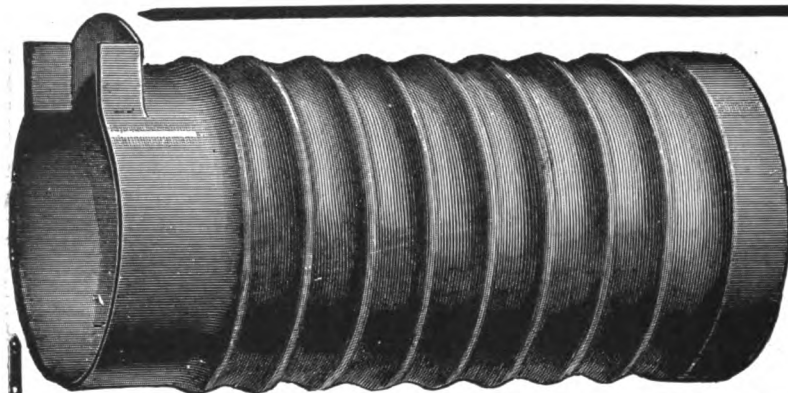
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EDWARD N. SMITH, Superintendent

WILLIAM KNIGHT, Ass't Sec'y and Treas.

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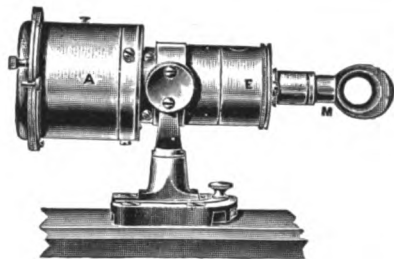
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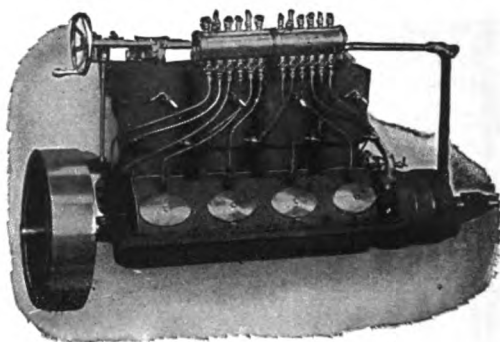
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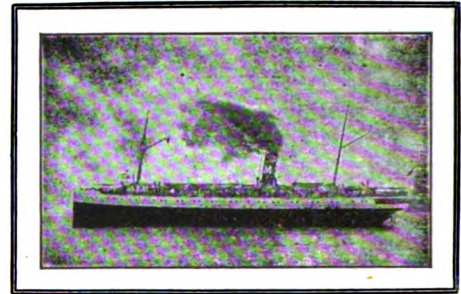
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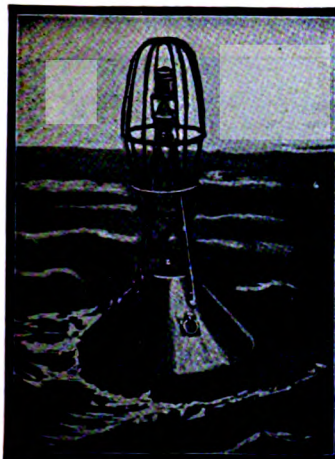
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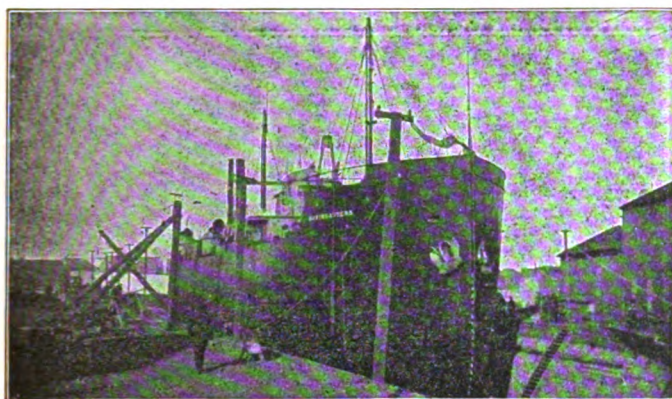
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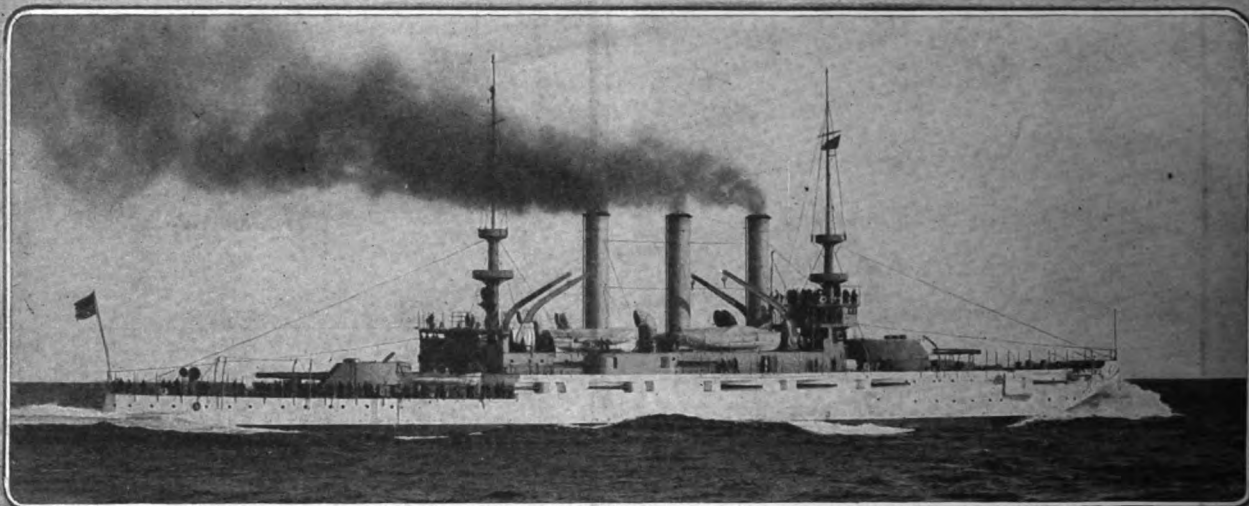
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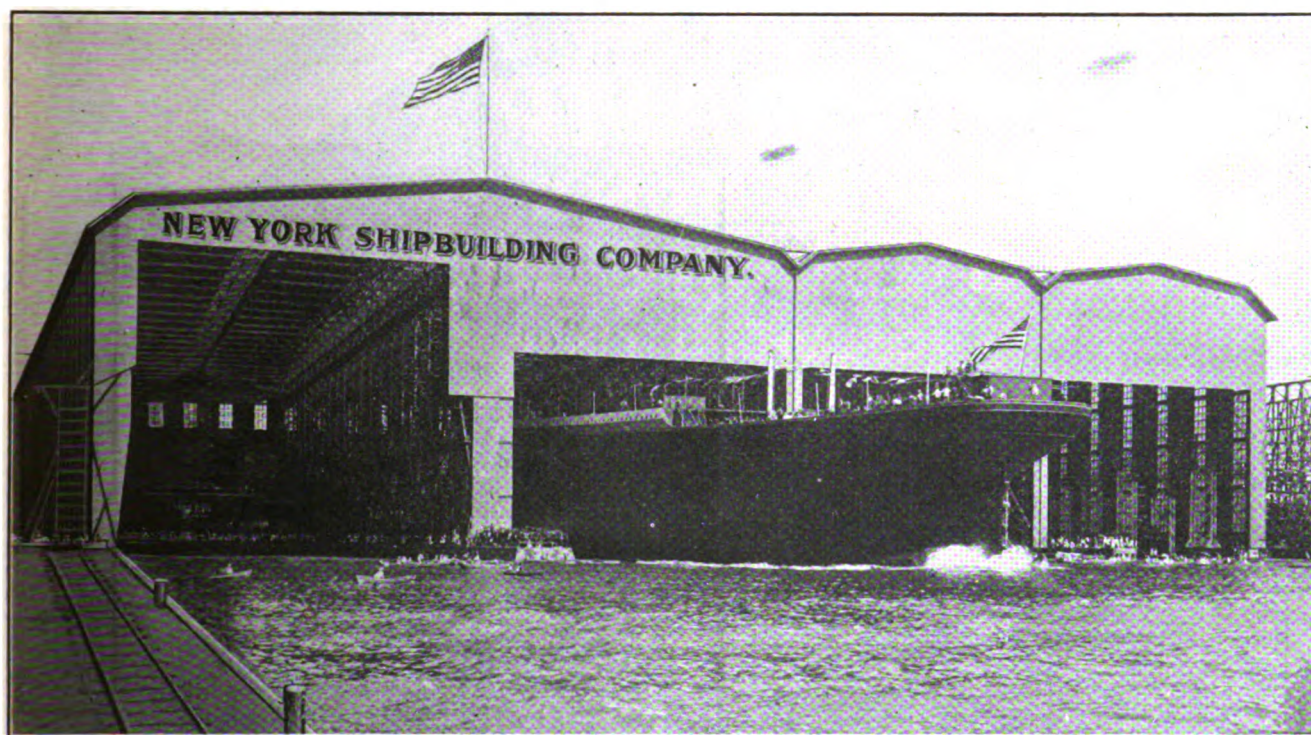
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## CONTENTS

Introduction	Compass Error by Azimuths
Variation	Longitude by Chronometer (or Time) Sight
Deviation	Remarks on Longitude
How to find the Deviation	Longitude by Sunrise and Sunset
Leeway	Sights
The Log	Chronometer Sight of a Star
The Lead-Line	Sumner's Method
Charts	Example of Sumner's Method with the Sun
Chart Sailing	Example of Sumner Lines with Two Stars
Dead-Reckoning	Great-Circle Sailing
Examples for Practice	Distance and Danger Angles
Working a Traverse	Allowance for Tides
Hove to	Keeping the Log
Shaping the Course	Rating a Chronometer
Navigation by Observation	Care of a Chronometer
Sextant Adjustments	Hints on Conducting Voyages
Index Error	Examples for Practice:
Hints on Taking Altitudes	Dead-Reckoning
Correcting the Altitude	Shaping Course by Mercator's Sailing
The Chronometer	Latitude by Meridian Altitude of Sun
The Nautical Almanac	Latitude by Meridian Altitude of Star
Apparent and Mean Time—The Equation	Latitude by Meridian Altitude Below the Pole
Latitude by Meridian Altitude of a Star	Latitude by Ex-Meridian Altitudes
Latitude by Meridian Altitude of a Planet	Latitude by the Polestar
Latitude by Meridian Altitude of the Moon	Longitude by Chronometer Sight
Meridian Altitude below the Pole	
Latitude by Ex-Meridian Altitude of the Sun	
Latitude by the Polestar	

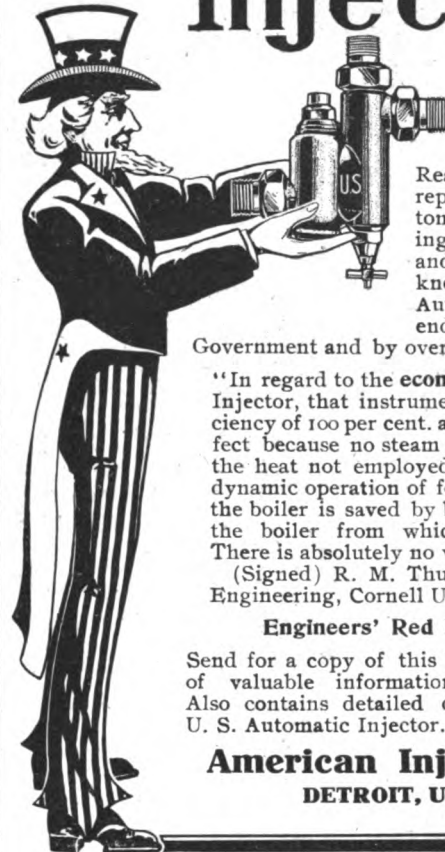
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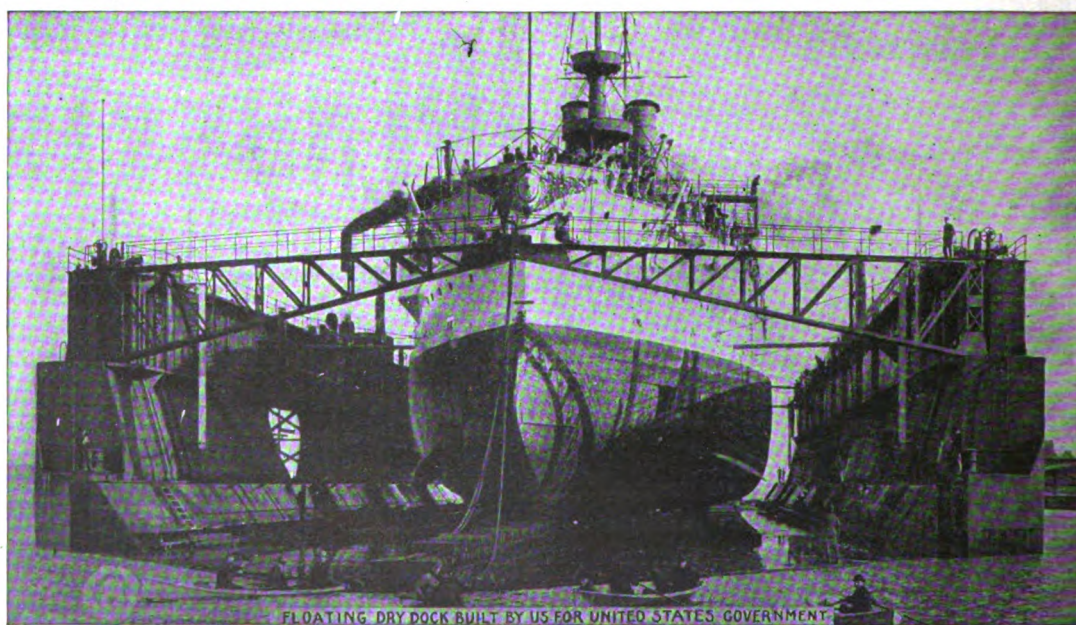
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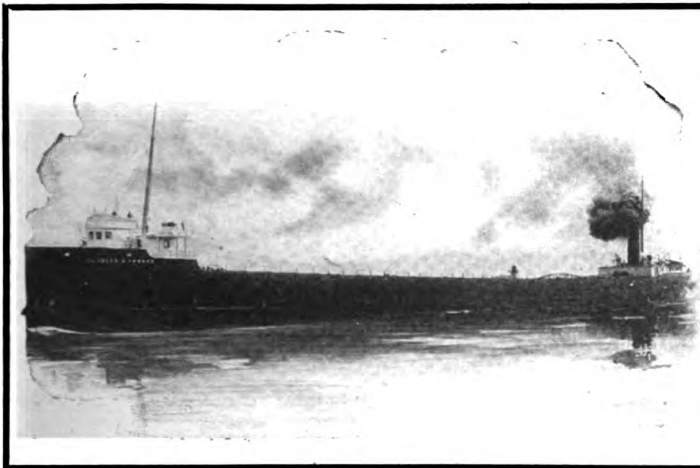
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AGENCIES.

Detroit: George W. House, Union Trust Building.

St. Louis: C. A. Thompson, 516 N. Third St.  
San Francisco: John Woodlock, 154-156 First St.



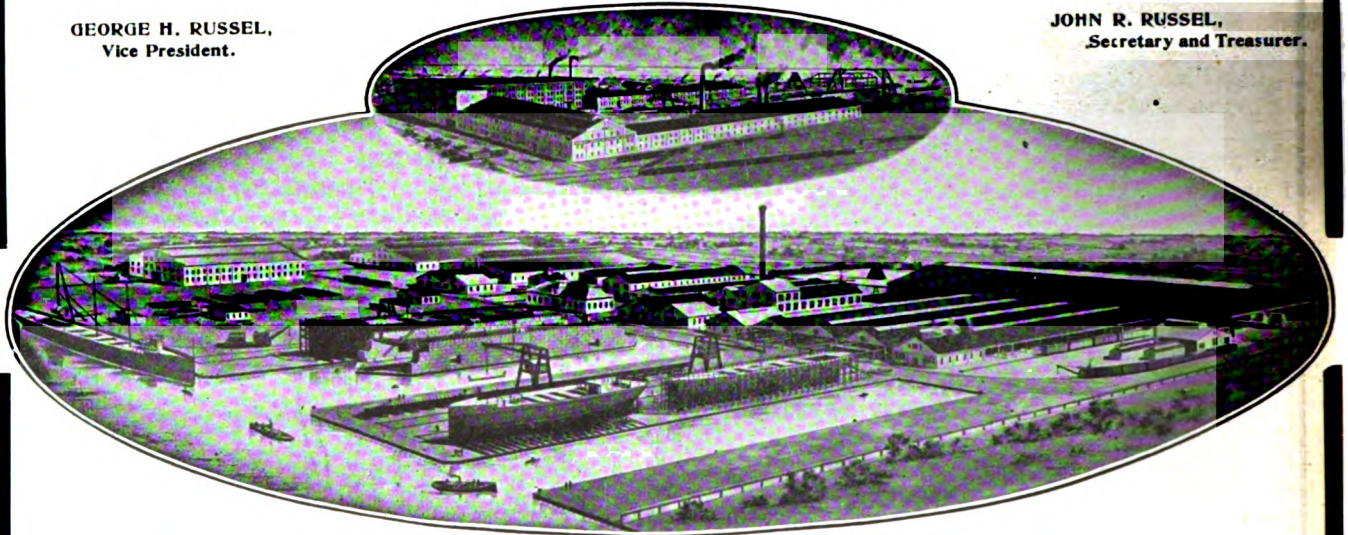
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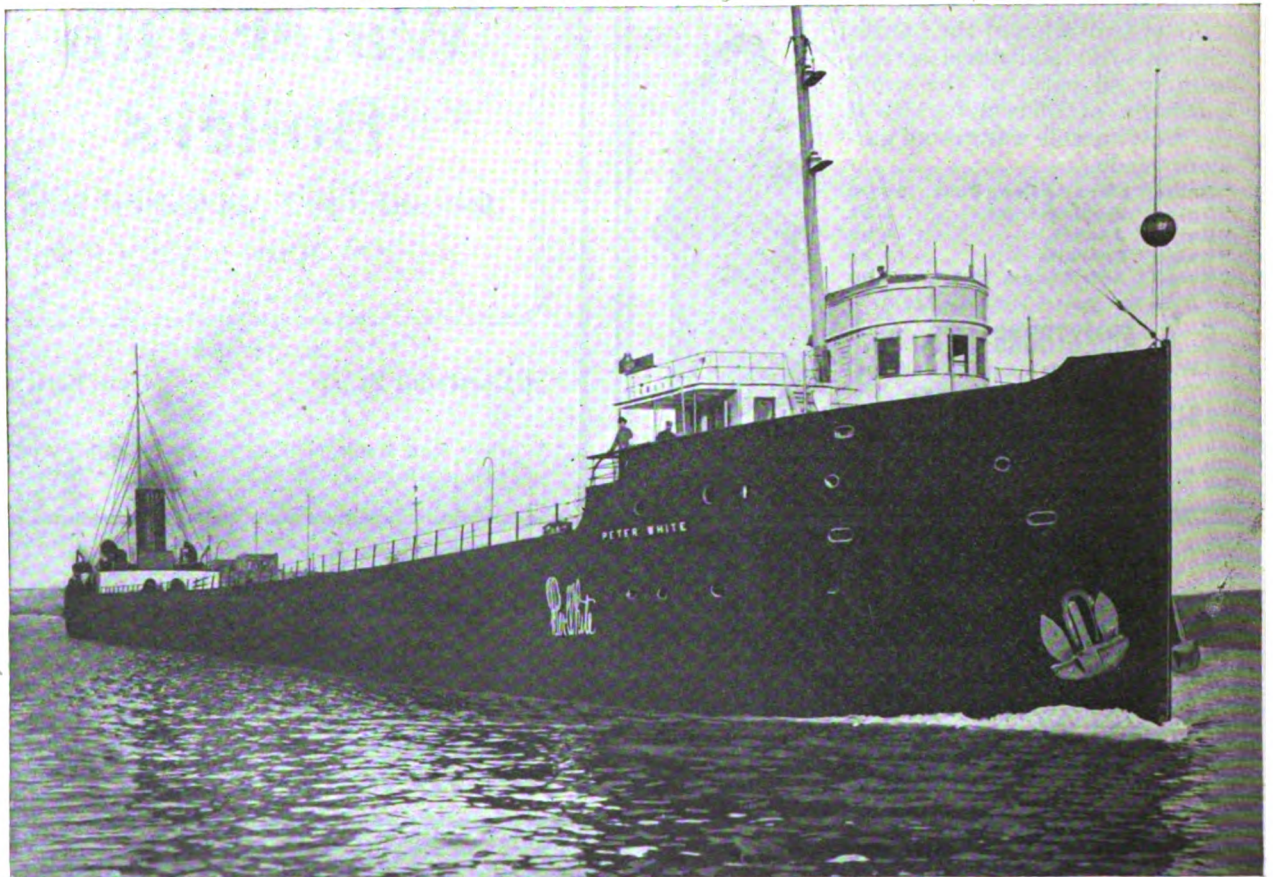
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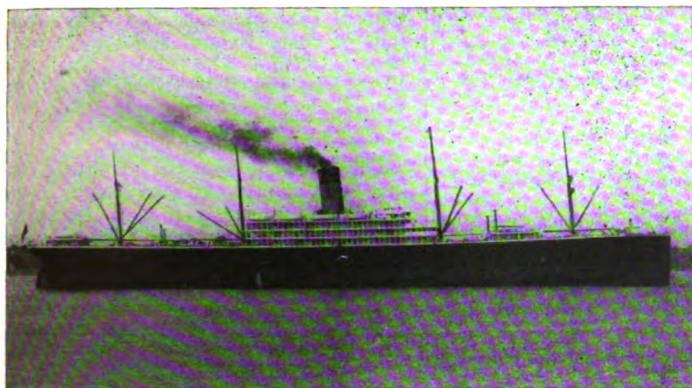
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One triple-expansion marine type vertical engine, 11¼-inch, 18-inch, 29 x 18-inch stroke. Inquire, Public Lighting Commission, No. 40 Atwater Street East, Detroit, Mich.

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Two 12-foot Scotch Boilers.  
One 13½-foot Scotch Boiler.  
One 10 16-25 x 16 triple expansion Engine.

Three 150-h. p. Almy Boilers.  
One 200-h. p. Tregurtha Boiler.  
One 14 30 x 24 fore and aft Engine and condenser.

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One 10 k. w. electric lighting Set.  
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One Providence Windlass, 50 fathoms 1½ in. chain.

Two thrust Shafts and Bearings, 8½ in. diameter.

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During its existence the company has insured property to the value of	\$21,108,343,494.00
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Issued certificates of profits to dealers	81,310,840.00
Of which there have been redeemed	73,744,440.00
Leaving outstanding at present time	7,566,400.00
Interest paid on certificates amounts to	19,469,981.85
On Dec. 31, 1905, the assets of the company amounted to	12,716,427.62

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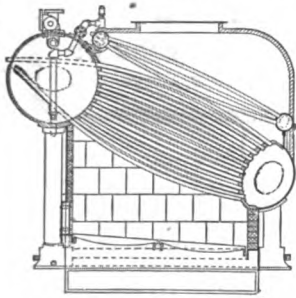
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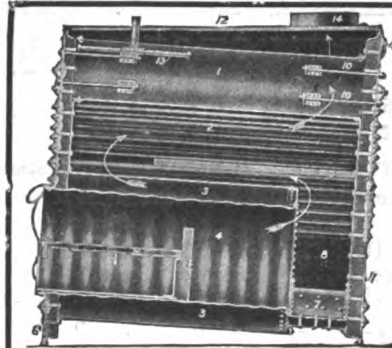
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Internally Fired.

Scotch and Water Tube types combined, eliminating all objections.

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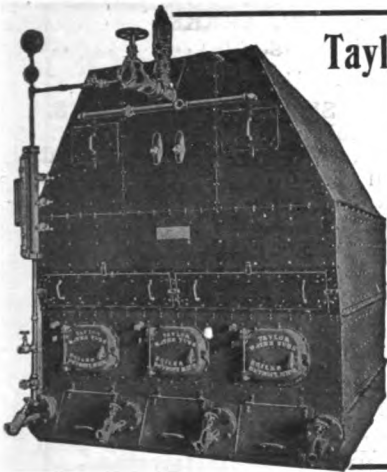
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Patent applied for.

Investigate before buying any other.

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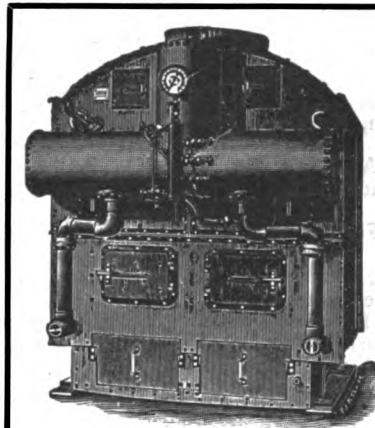
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Vertical Tubes, sectional, large steam space and liberating area.

Fire box, combustion chamber, and course for the furnace gases similar to the Scotch Marine. Free circulation type.

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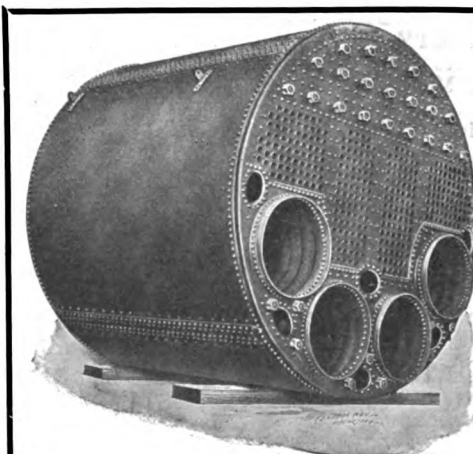


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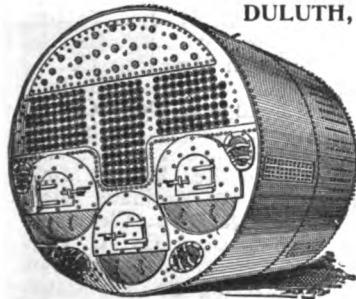
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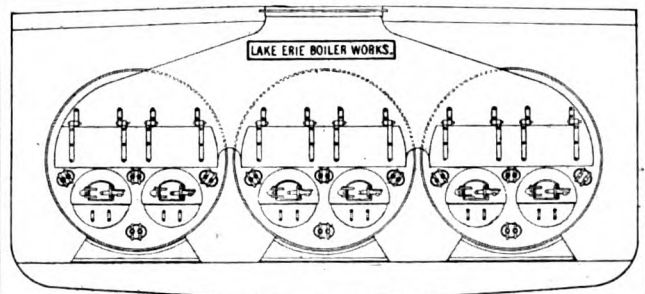
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[See accompanying Index of Advertisers for full addresses of concerns in this Directory.]

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American Ship Building Co.....  
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Hickler Bros.....  
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Smith Co., L. P. & J. A..Cleveland.  
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Schenectady, N. Y.

## FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.,  
Cleveland.  
Fore River Shipbuilding Co.,  
Quincy, Mass.

## FLUE WELDING.

Fix's S. Sons, Cleveland.

## FUELING COMPANIES AND COAL DEALERS.

Hanna, M. A. & Co., Cleveland.  
Parker Bros. Co., Ltd., Detroit.  
Pickands, Mather & Co., Cleveland.  
Pittsburg Coal Co., Cleveland.  
Smith, Stanley B., & Co., Detroit.  
Toledo Fuel Company, Toledo, O.

## FURNACES FOR BOILERS.

Continental Iron Works, New York

## GAS BUOYS.

Safety Car Heating & Lighting Co.,  
New York.

## GAS AND GASOLINE ENGINES.

Chase Machine Co., Cleveland.

## GAUGES, STEAM AND VACUUM.

Lunkenheimer Co., Cincinnati.

## GAUGES, WATER.

Lunkenheimer Co., Cincinnati, O.

## GENERATING SETS.

General Electric Co.,  
Schenectady, N. Y.

## GRAPHITE.

Dixon Crucible Co., Joseph.  
Jersey City, N. J.

## HAMMERS, STEAM.

Chase Machine Co., Cleveland.

## HEATING AND VENTILATING APPARATUS.

American Blower Co., Detroit, Mich.

## HOISTS FOR CARGO, ETC.

American Ship Building Co.,  
Cleveland.  
Brown Hoisting Machinery Co.,  
Cleveland.  
Chase Machine Co., Cleveland.  
Dake Engine Co.,  
Grand Haven, Mich.  
General Electric Co., New York.  
Hyde Windlass Co., Bath, Me.  
Marine Iron Co., Bay City.

## HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co.,  
Cuyahoga Falls, O.

## HYDRAULIC DREDGES.

Great Lakes Engineering Works,  
Detroit.

## HYDRAULIC TOOLS.

Watson-Stillman Co., The,  
New York.

## ICE MACHINERY.

Great Lakes Engineering Works,  
Detroit.  
Roelker, H. B., New York.

## INJECTORS.

American Injector Co., Detroit.  
Jenkins Bros., New York.  
Lunkenheimer Co., Cincinnati.  
Penberthy Injector Co.,  
Detroit, Mich.

## INSURANCE, MARINE.

Atlantic Mutual Insurance Co.,  
New York.  
Elphicke, C. W. & Co., Chicago.  
Gilchrist & Co., C. P., Cleveland.  
Hawgood & Co., W. A., Cleveland.  
Helm & Co., D. T., Duluth.  
Hutchinson & Co., Cleveland.  
McCarthy, T. R., Montreal.  
McCurdy, Geo. L., Chicago.  
Mitchell & Co., Cleveland.  
Parker Bros. Co., Ltd., Detroit.  
Peck, Chas. E. & W. F.,  
New York and Chicago.  
Prindiville & Co., Chicago.  
Richardson, W. C., Cleveland.  
Sullivan, D. & Co., Chicago.

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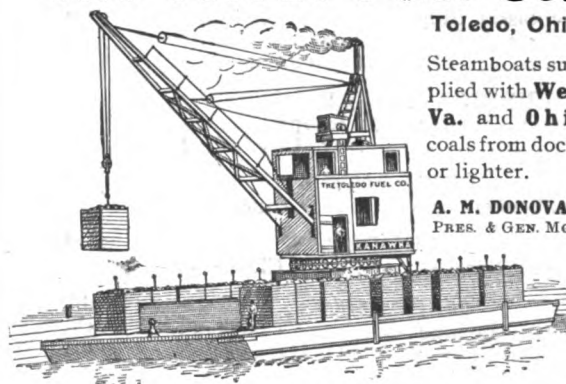
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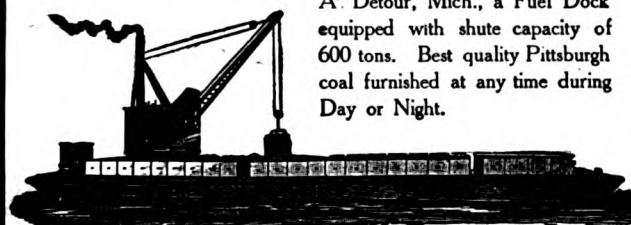
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Hanna, M. A. & Co.....Cleveland.  
Pickands, Mather & Co., Cleveland.

**LAUNCHES—STEAM, NAPHTHA,  
ELECTRIC.**  
Truscott Boat Mfg. Co.....  
.....St. Joseph, Mich.

**LIFE PRESERVERS, LIFE  
BOATS, BUOYS.**  
Armstrong Cork Co.....Pittsburg.  
Carley Life Float Co.....  
.....New York, N. Y.  
Drein, Thos. & Son.....  
.....Wilmington, Del.  
Kahnweiler's Sons, D.....New York.

**LIGHTS, SIDE AND SIGNAL.**  
Russell & Watson.....Buffalo.

**LOGS.**  
Nicholson Ship Log Co., Cleveland.  
Walker & Sons, Thomas.....  
.....Birmingham, Eng.

**LUBRICATING GRAPHITE.**  
Dixon Crucible Co., Joseph.....  
.....Jersey City, N. J.

**LUBRICATORS.**  
Lunkenheimer Co. .... Cincinnati.

**LUMBER.**  
Martin-Barriss Co. .... Cleveland.

**MACHINISTS.**  
Chase Machine Co.....Cleveland.  
Hickler Bros., Sault Ste. Marie, Mich.  
Lockwood Mfg. Co.....  
.....East Boston, Mass.  
McLaughlin Iron Works, Ashtabula, O.

**MACHINE TOOLS (WOOD  
WORKING).**  
Atlantic Works, Inc....Philadelphia.

**MARINE RAILWAYS.**  
Hickler Bros., Sault Ste. Marie, Mich.

**MARINE RAILWAYS,  
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Crandall & Son, H. I.....  
.....East Boston, Mass.

**MATTRESSES, CUSHIONS,  
BEDDING.**  
Fogg, M. W.....New York

**MECHANICAL DRAFT FOR  
BOILERS.**  
American Blower Co., .....Detroit.  
American Ship Building Co.....  
.....Cleveland.  
Detroit Ship Building Co., Detroit.  
Great Lakes Engineering Works....  
.....Detroit.

**METALLIC PACKING.**  
Katzenstein, L. & Co., New York.  
The National Metallic Packing Co..  
.....Oberlin, O.

**MOTORS, GENERATORS—  
ELECTRIC.**  
General Electric Co.....  
.....Schenectady, N. Y.

**NAUTICAL INSTRUMENTS.**  
Ritchie, E. S., & Sons.....  
.....Brookline, Mass.

**NAVAL ARCHITECTS.**  
Hynd, Alexander .....Cleveland  
Kidd, Joseph .....Duluth, Minn.  
Mosher, Chas. D.....New York.  
Nacey, James .....Cleveland  
Wood, W. J.....Chicago

**OAKUM.**  
Stratford, Oakum Co.....  
.....Jersey City, N. J.

**OILS AND LUBRICANTS.**  
Dixon Crucible Co., Joseph.....  
.....Jersey City, N. J.

**PACKING.**  
Jenkins Bros.....New York.  
Katzenstein, L. & Co..New York.  
Robertson, Jos. L. & Sons.....  
.....New York.  
The National Metallic Packing Co..  
.....Oberlin, O.  
Republic Belting & Supply Co.....  
.....Cleveland, O.

**PAINTS.**  
Baker, Howard H. & Co....Buffalo.  
Upson-Walton Co.....Cleveland.

**PATTERN SHOP MACHINERY.**  
Atlantic Works, Inc. ..Philadelphia.

**PILE DRIVING AND SUBMAR-  
INE WORK.**  
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Dunbar & Sullivan Dredging Co....  
.....Buffalo.  
Great Lakes Dredge & Dock Co....  
.....Chicago.  
Hickler Bros., Sault Ste. Marie, Mich.  
Hubbell Co., H. W...Saginaw, Mich.  
Parker Bros. Co., Ltd.....Detroit.  
Smith Co., L. P. & J. A..Cleveland.  
Starke Dredge & Dock Co., C. H..  
.....Milwaukee.  
Sullivan, M.....Detroit.

**PIPE, WROUGHT IRON.**  
Bourne-Fuller Co.....Cleveland, O.

**PLANING MILL MACHINERY.**  
Atlantic Works, Inc....Philadelphia.

**PLATES—SHIP, STRUCTURAL,  
ETC.**  
Bourne-Fuller Co.....Cleveland, O.  
Otis Steel Co.....Cleveland.

**PRESSURE REGULATORS.**  
Ross Valve Co.....Troy, N. Y.

**PROPELLER WHEELS.**  
American Ship Building Co.....  
.....Cleveland.  
Atlantic Works ..East Boston, Mass.  
Cramp, Wm. & Sons..Philadelphia.  
Detroit Ship Building Co...Detroit.  
Fore River Shipbuilding Co.....  
.....Quincy, Mass.  
Great Lakes Engineering Works....  
.....Detroit.  
Hyde Windlass Co.....Bath, Me.  
Lockwood Mfg. Co.....  
.....East Boston, Mass.  
Milwaukee Dry Dock Co.....  
.....Milwaukee.  
Newport News Ship Building Co..  
.....Newport News, Va.  
Roelker, H. B.....New York.  
Sheriffs Mfg. Co.....Milwaukee.  
Superior Ship Building Co.....  
.....Superior, Wis.  
Thropp & Sons Co., J. E.....  
.....Trenton, N. J.  
Toledo Ship Building Co.....Toledo.  
Trout, H. G.....Buffalo.

**PROJECTORS, ELECTRIC.**  
General Electric Co.....  
.....Schenectady, N. Y.

**PUMPS FOR VARIOUS  
PURPOSES.**  
Great Lakes Engineering Works..  
.....Detroit.  
Kingsford Foundry & Machine  
Works .....Oswego, N. Y.  
Wheeler Condenser & Engineering  
Co. ....New York  
Roelker, H. B.....New York

**REGISTER FOR CLASSIFICA-  
TION OF VESSELS.**  
Great Lakes Register.....Cleveland.

**RIVETS, STEEL FOR SHIPS  
AND BOILERS.**  
Bourne-Fuller Co.....Cleveland, O.  
Great Lakes Engineering Works....  
.....Detroit.

**SAFETY VALVES.**  
Lunkenheimer Co.....Cincinnati.

**SAIL MAKERS.**  
Baker, Howard H. & Co....Buffalo.  
Upson-Walton Co.....Cleveland.

**SALVAGE COMPANIES.**  
See Wrecking Companies.

**SEARCH LIGHTS.**  
General Electric Co.....  
.....Schenectady, N. Y.

**SHEARS.**  
See Punches, and Shears.

**SHIP AND BOILER PLATES  
AND SHAPES.**  
Bourne-Fuller Co.....Cleveland, O.  
Otis Steel Co.....Cleveland.

**SHIP BUILDERS.**  
American Ship Building Co.....  
.....Cleveland.  
Atlantic Works ..East Boston, Mass.  
Buffalo Dry Dock Co.....Buffalo.  
Collingwood Shipbuilding Co.....  
.....Collingwood, Ont.  
Cramp, Wm. & Sons..Philadelphia.  
Chicago Ship Building Co..Chicago.  
Detroit Ship Building Co...Detroit.  
Fore River Ship Building Co.....  
.....Quincy, Mass.  
Great Lakes Engineering Works....  
.....Detroit.  
Lockwood Mfg. Co.....  
.....East Boston, Mass.  
Manitowoc Dry Dock Co.....  
.....Manitowoc, Wis.  
Maryland Steel Co.....  
.....Sparrow's Point, Md.  
Milwaukee Dry Dock Co.....  
.....Milwaukee.  
Newport News Ship Building Co..  
.....Newport News, Va.  
New York Shipbuilding Co.....  
.....Camden, N. J.  
Roach's Ship Yard.....Chester, Pa.  
Shipowner's Dry Dock Co..Chicago.  
Toledo Ship Building Co.....Toledo.

**SHIP CHANDLERS.**  
Baker, Howard H. & Co....Buffalo.  
Marine Mfg. & Supply Co.....  
.....New York  
Upson-Walton Co.....Cleveland.

**SHIP DESIGNERS.**  
Kidd, Joseph .....Duluth.  
Steel, Nacey, & Hynd....Cleveland.  
Wood, W. J.....Chicago

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## NAMES OF CHARTS

### LAKE ONTARIO

Lake Ontario  
St. Lawrence River Nos. 1, 2, 3 4, 5, 6  
Coast-Charts Nos. 1, 2, 3, 4, 5  
Oswego Harbor  
Little Sodus Bay  
Great Sodus Bay  
Charlotte Harbor  
Niagara Falls

### LAKE ERIE

Lake Erie  
Coast-Charts Nos. 1, 2, 3, 4, 5, 6, 7  
Detroit River  
Lake St. Clair  
St. Clair River  
Buffalo Harbor and Niagara River  
Dunkirk Harbor  
Erie Harbor and Presque Isle  
Conneaut Harbor  
Ashtabula Harbor  
Fairport Harbor  
Cleveland Harbor  
Lorain Harbor  
Huron Harbor  
Sandusky Bay  
Maumee Bay and Maumee River

### LAKE HURON

Lake Huron and Georgian Bay  
South End of Lake Huron  
Saginaw Bay  
Straits of Mackinac  
Coast-Charts Nos. 5, 6, 7, 8  
Sand Beach Harbor of Refuge  
Saginaw River  
Tawas Harbor  
Thunder Bay  
Presque Isle and Middle Island  
St. Marys River Nos. 1, 2, 3  
St. Joseph Channel and Western End of North Channel

### LAKE MICHIGAN

Lake Michigan  
North End of Lake Michigan

South End of Lake Michigan  
Beaver Island Group  
Grand and Little Traverse Bays  
Coast-Charts Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9  
South End of Green Bay  
North End of Green Bay  
Manistique Harbor  
Charlevoix Harbor  
South Fox Island Shoals  
Manitou Passage  
Frankfort Harbor  
Manistee Harbor  
Ludington Harbor  
Muskegon Harbor  
Harbor at Michigan City  
Lake Front, Chicago  
Milwaukee Harbor  
Sheboygan Harbor  
Manitowoc Harbor  
Sturgeon Bay, Canal, and Harbor of Refuge  
Head of Green Bay  
Little Bay de Noc  
Portage Lake, Manistee Co.

### LAKE SUPERIOR

Lake Superior  
Lake Superior Nos. 1, 2, 3  
Coast-Charts Nos. 1, 6  
Coast-Chart No. 8, including Isle Royal  
Grand Island  
Marquette and Presque Isle Harbors  
Huron Bay and Huron Islands  
L'Anse and Keweenaw Bay  
Portage Lake and River  
Copper Harbor  
Agate Harbor  
Eagle Harbor  
Eagle River  
Ontonagon Harbor  
Apostle Islands Nos. 1, 2  
Duluth and Superior Harbor  
Agate and Burlington Bays (Two Harbors)

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**SHIP TIMBER.**

Martin-Barriss Co..... Cleveland.

**SIGNALS—SUBMARINE.**

Submarine Signal Co..... Boston.

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..... Jersey City, N. J.**STAYBOLT IRON OR STEEL BARS, HOLLOW OR SOLID.**Falls Hollow Staybolt Co.....  
..... Cuyahoga Falls, O.**STEAM VESSELS FOR SALE.**

Holmes, Samuel ..... New York.

McCarthy, T. R. .... Montreal, Can.

**STEAMSHIP LINES, PASS, AND FREIGHT.**

American Line ..... New York.

Anchor Line ..... Buffalo.

Boston Steamship ..... Boston.

C. &amp; B. Transit Co..... Cleveland.

International Mercantile Marine Co.  
..... Philadelphia.

Mallory Line ..... New York.

New York & Cuba Mail S. S. Co..  
..... New York.

Red Star Line ..... New York.

**STEAM SPECIALTIES.**

Robertson, Jas. L. &amp; Sons .. New York.

**STEEL CASTINGS.**

Otis Steel Co..... Cleveland.

**STEERING APPARATUS.**

American Ship Building Co.....

..... Cleveland.

Chase Machine Co..... Cleveland.

Dake Engine Co.....

..... Grand Haven, Mich.

Detroit Ship Building Co..... Detroit.

Hyde Windlass Co..... Bath, Me.

Marine Mfg. &amp; Supply Co.....

..... New York.

Sheriffs Mfg. Co..... Wilwaukee.

**SUBMARINE DIVING APPARATUS.**

Morse &amp; Son, A. J. .... Boston.

Schrader's Son, Inc. A.... New York.

**SURVEYORS, MARINE.**

Hynd, Alexander ..... Cleveland.

Parker Bros. Co., Ltd..... Detroit.

Nacey, James ..... Cleveland.

Steel, Adam ..... Cleveland.

Wood, W. J. .... Chicago.

**TESTS OF MATERIALS.**

Hunt, Robert W. &amp; Co.... Chicago.

Lunkenheimer Co.... Cincinnati, O.

**THERMIT**

Goldschmidt Thermit Co.,

..... New York City.

**TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.**

Watson-Stillman Co..... New York.

**TOOLS, WOOD WORKING.**

Atlantic Works, Inc.... Philadelphia.

**TOWING MACHINES.**

American Ship Windlass Co.....

..... Providence, R. I.

Chase Machine Co..... Cleveland

**TOWING COMPANIES.**Donnelly Salvage & Wrecking Co..  
..... Kingston, Ont.

Great Lakes Towing Co.. Cleveland.

**TRUCKS.**

Boston &amp; Lockport Block Co.....

..... Boston.

**TUBING, SEAMLESS.**

Shelby Steel Tube Co..Pittsburg, Pa.

**VALVES, STEAM SPECIALTIES, ETC.**

Jenkins Bros. .... New York

Lunkenheimer Co..... Cincinnati.

Ross Valve Co..... Troy, N. Y.

**VALVES FOR WATER AND GAS.**

Ashton Valve Co..... Boston.

Lunkenheimer Co..... Cincinnati.

Republic Belting &amp; Supply Co.....

..... Cleveland, O.

Ross Valve Co..... Troy, N. Y.

Scoville Check Valve Co.....

..... Ashtabula, O.

**VESSEL AND FREIGHT AGENTS.**

Billett, T. R. .... Winnipeg.

Boland, John J. .... Buffalo.

Douglas, G. L. Jr. .... Duluth

Elphicke, C. W. &amp; Co.... Chicago.

Hall, John B. .... Buffalo.

Helm &amp; Co., D. T. .... Duluth.

Hawgood &amp; Co., W. A.... Cleveland.

Holmes, Samuel ..... New York.

Hutchinson &amp; Co..... Cleveland.

McCarthy, T. R. .... Montreal.

**VESSELS AND FREIGHT AGENTS—Con.**

Mitchell &amp; Co..... Cleveland.

Parker Bros. Co., Ltd..... Detroit.

Prindiville &amp; Co..... Chicago.

Richardson, W. C. .... Cleveland.

Sullivan, D. &amp; Co..... Chicago

**WATER GAUGES.**

Lunkenheimer Co.... Cincinnati, O.

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Lunkenheimer Co..... Cincinnati.

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Bunker, E. A. .... New York.

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Upson-Walton Co..... Cleveland.

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American Ship Windlass Co.....

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American Ship Building Co.....

..... Cleveland.

Dake Engine Co.....

..... Grand Haven, Mich.

Hyde Windlass Co..... Bath, Me.

Marine Mfg. &amp; Supply Co.....

..... New York.

**WINCHES.**

American Ship Windlass Co.....

..... Providence, R. I.

Hyde Windlass Co..... Bath, Me.

**WOOD WORKING MACHINERY.**

Atlantic Works, Inc.... Philadelphia.

**WRECKING AND SALVAGE COMPANIES.**Donnelly Salvage & Wrecking Co..  
..... Kingston, Ont.

Great Lakes Towing Co.. Cleveland.

Parker Bros. Co., Ltd..... Detroit.

**YACHT AND BOAT BUILDERS.**

Drein, Thos. &amp; Son.....

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Manitowoc Dry Dock Co.....

..... Manitowoc, Wis.

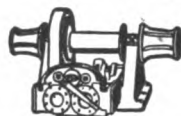
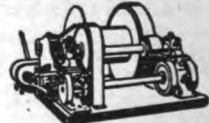
Truscott Boat Mfg. Co.....

..... St. Joseph, Mich.

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Drein, Thos. &amp; Son.....

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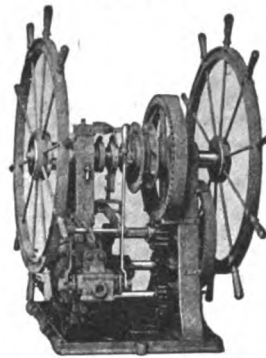
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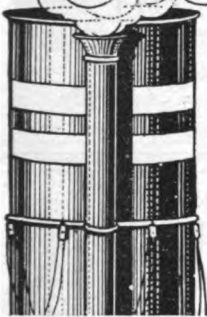
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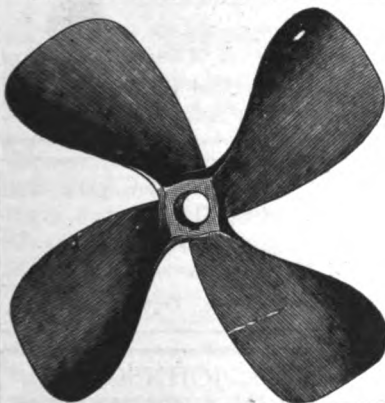
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The star (\*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on page noted.  
The dagger (†) indicates that advertisement appears once a month.

Almy Water Tube Boiler Co. .... 37	Douglas, G. L., Jr. .... 48	*Lake Erie Boiler Compound Co. —	Red Star Line ..... 48
American Blower Co. .... 52	Dreln, Thos. & Son ..... 49	Lake Erie Boiler Works ..... 37	Richardson W. O. .... 46
American Injector Co. .... 9	Dunbar & Sullivan Dredging Co. 39	*LeMols Scientifique et Industrial 41	Roberts Safety Water-Tube
American Line ..... 48	East End Boiler Works ..... 37	Lockwood Mfg. Co. .... 50	Boiler Co. .... 11
American Ship Building Co. .... 4	Elphicks, C. W. & Co. .... 46	Lunkenheimer Co. .... 3	*Robertson, Jas. L. & Sons .....
American Ship Windlass Co. .... 2	*Emerson Shoe Co. .... 50		Roelker, H. B. .... 50
*Armstrong Manufacturing Co. .... 10	Erie Railroad ..... 50		Ross Valve Co. .... 50
Armstrong, A. E., Mfg. Co. .... 11			
Armstrong Cork Co. .... 52	Falls Hollow Staybolt Co. .... 45	Maytham, Frank ..... 46	Safety Car Heating & Lighting Co. 5
Atlantic Mutual Ins. Co. .... 36	Fix's Sons, S. .... 50	McCarthy, T. R. .... 46	Scherzer Rolling Lift Bridge Co. 45
Atlantic Works ..... 49	Fletcher Co., W. & A. .... 49	McCurdy, Geo. L. .... 35	Schrader's Son, Inc., A. .... 50
*Atlantic Works, Inc. .... —	Fogg, M. W. .... 50	McLaughlin Iron Works ..... 41	*Seoville Check Valve Co. .... —
	Fore River Ship Building Co. .... 49	MacDonald, Ray G. .... 46	Shaw, Warren, Cady & Oakes .... 46
Baker, Howard H. & Co. .... 52	General Electric Co. .... 52	Mallory Line ..... 43	*Shelby Steel Tube Co. .... —
Belcher, Fred P. .... 46	Gilchrist, Albert J. .... 46	Marine Iron Co., Bay City, Mich. 47	Sheriffs Mfg. Co. .... 45
Big Four Ry. .... 41	*Goldschmidt Thermit Co. .... —	*Marine Mfg. & Supply Co. .... —	Shipping World Year Book. .... 47
Billett, T. R. .... 46	Goulder, Holding & Masten .... 46	Marine Torch Co., The ..... 45	*Shipowners' Dry Dock Co. .... —
Boland, J. J. .... 46	Gould's Nautical School. .... 36	Martin Barriss Co. .... 49	Smith Coal & Dock Co., Stanley B. 3
*Boston & Lookport Block Co. .... —	Great Lakes Dredge & Dock Co. 39	Maryland Steel Co. .... 10	Smooth-On Mfg. Co. .... 51
Boston Steamship Co. .... 48	Great Lakes Engineering Works. 12	Milwaukee Dry Dock Co. .... 5	Standard Contracting Co. .... 41
Bourne-Fuller Co. .... 35	Great Lakes Register ..... 38	Mitchell & Co. .... 46	Starke Dredge & Dock Co., C. H. 41
Bowers, L. M. & Co. .... 37	*Great Lakes Towing Co. .... 9	Morse & Son, A. J. .... 47	*State Manufacturing Co. .... —
Breymann & Bros., G. H. .... 39		Mosher Water Tube Boiler Co. .... 37	Stratford Oakum Co., Geo. .... 45
Briggs, Marvin ..... 36			*Submarine Signal Company. .... —
*Brown Hoisting Machinery Co. .... —	Hall, John B. .... 46	Nacey & Hynd ..... 47	Sullivan, M. .... 41
Buffalo Dredging Co. .... 39	Hanna & Co., M. A. .... 39	National Metallic Packing Co. .... 11	Sullivan & Co. .... 46
Buffalo Dry Dock Co. .... 5	Hawgood & Co., W. A. .... 46	Newport News Ship Building & Dry Dock Co. .... 6	Superior Ship Building Co. .... 4
Bunker, Edw. A. .... 52	Helm & Co., D. T. .... 46	New York & Cuba Mail S. S. Co. 48	
	Hickler Bros. .... 39	New York Shipbuilding Co. .... 7	Taylor Water-Tube Boiler Co. .... 37
*Carley Life Float Co. .... —	Holmes, Samuel ..... 46	*Nicholson Ship Log Co. .... —	Tietjen & Lang Dry Dock Co. .... 50
Chase Machine Co. .... 44	Hoyt, Dustin & Kelley. .... 46	Northwestern Steam Boiler & Mfg. Co. .... 37	Toledo Fuel Co. .... 41
*Chicago Nautical School. .... —	Hubbell Co., H. W. .... 39		Toledo Ship Building Co. .... 5
Chicago Ship Building Co. .... 4	Hunt & Co., Robert W. .... 47	Otis Steel Co. .... 11	Trout, H. G. .... 45
Cleveland City Forge & Iron Co. 51	Hutchinson & Co. .... 46		Truscott Boat Mfg. Co. .... 2
*Collingwood Shipbuilding Co. .... —	Hyde Windlass Co. .... 35	Parker Bros. Co. .... 46	Upson-Walton Co. .... 52
Continental Iron Works ..... 2		Peck, Chas. E. & W. F. .... 36	Vance & Joys Co. .... 46
Cory, Chas. & Son ..... 50	International Mercantile Marine Co. 48	Penberthy Injector Co. .... 9	
Cramp, Wm. & Sons, S. & E. B. Co. 8	Jenkins Brothers ..... 52	Pickands, Mather & Co. .... 41	Walker, Thomas & Son ..... 2
*Crandall & Son, H. I. .... —	Jenkins, Russell & Eichelberger. 46	Pittsburg Coal Co. .... 3	Ward Line ..... 48
C & B. Transit Co. .... 48	Kahnweiler's Sons, David ..... 51	Prindiville & Company ..... 47	*Watson-Stillman Co. .... —
Dake Engine Co. .... 45	Katzenstein & Co., L. .... 51	Quintard Iron Works Co. .... 10	*Wheeler Condenser & Engineer- ing Co. .... —
Dearborn Drug & Chemical Wks. 8	Kidd, Joseph ..... 47		*Williams, G. H., Co. .... —
Delaware River Iron S. B. & E. Works 51	Kingsford Foundry & Machine Works 87		White, Johnson, McCalin & Cannon .... 46
Detroit Ship Building Co. .... 4	Kremer, C. E. .... 46		Wood, W. J. .... 48
Dixon Crucible Co., Joseph. .... 45			
Donnelly Salvage & Wrecking Co. 49			

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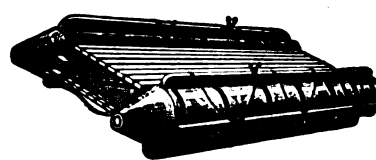
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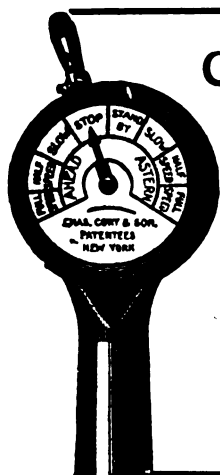
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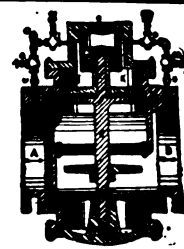
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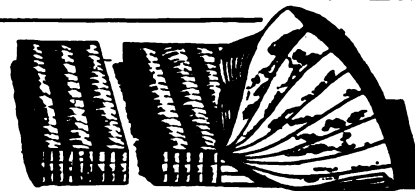
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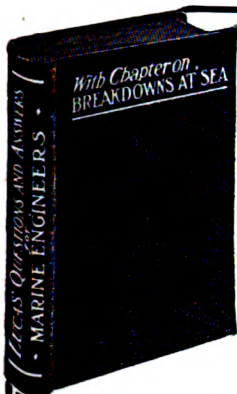
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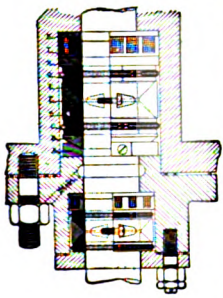
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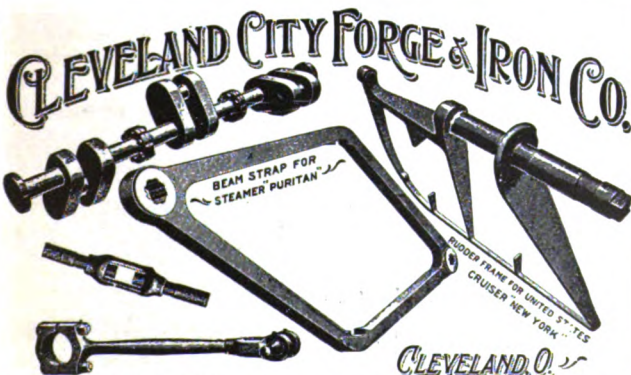
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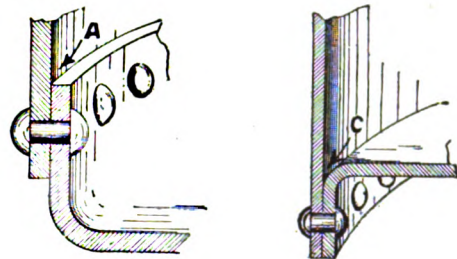
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